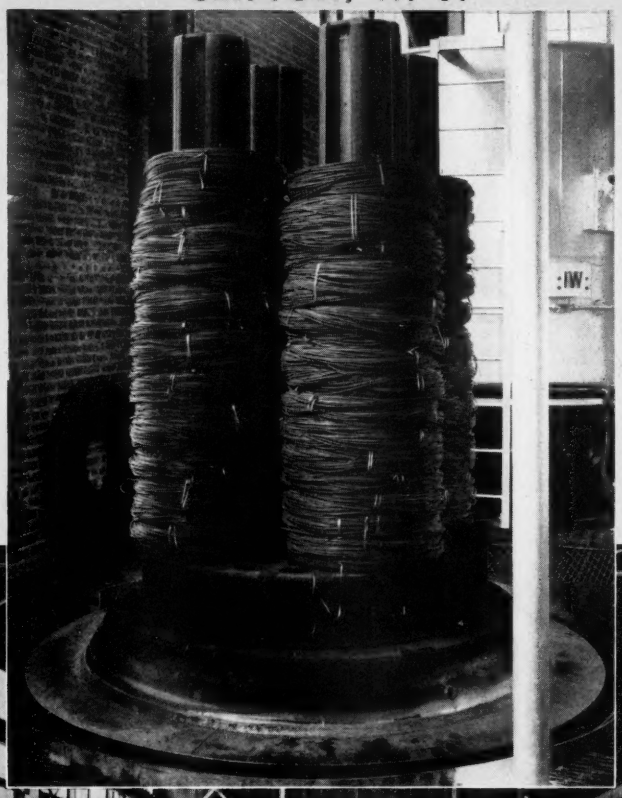
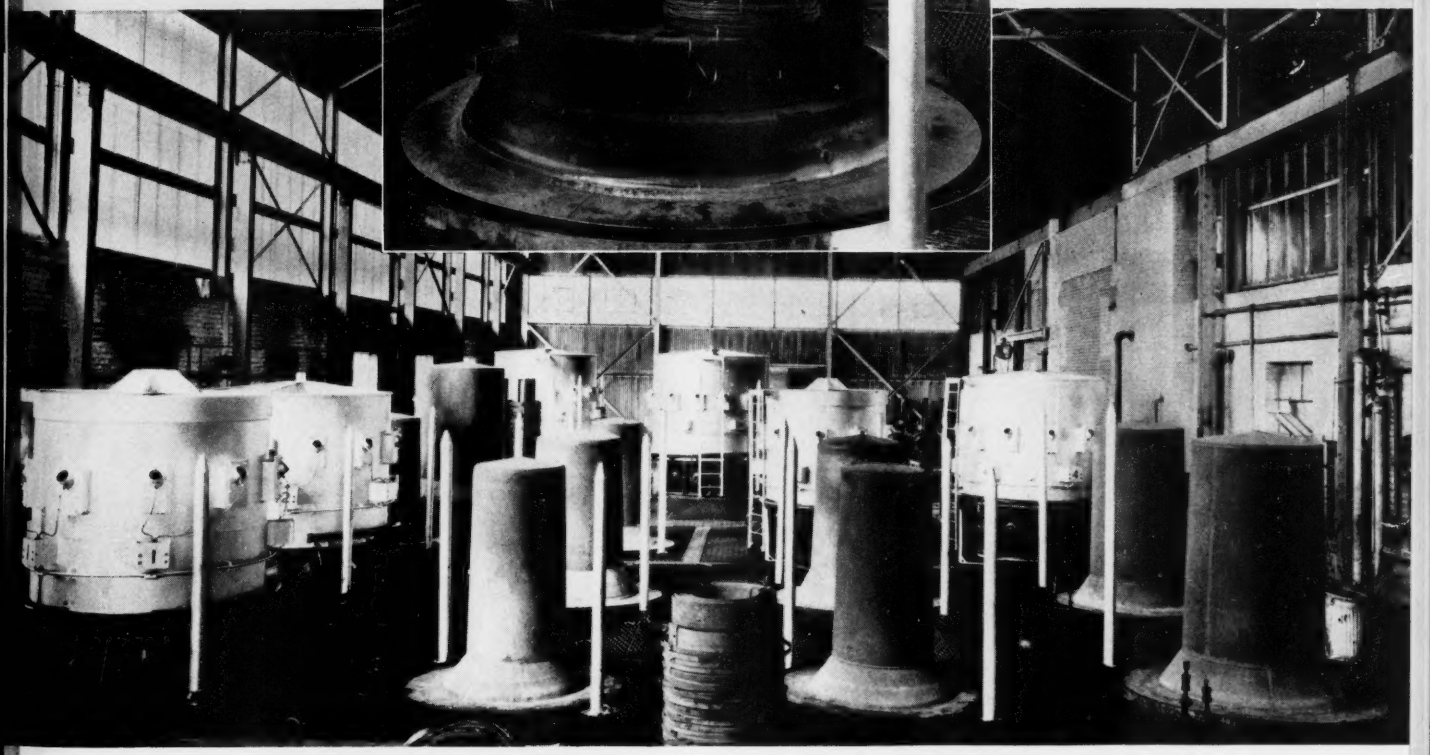
WILSON WIRE ANNEALING FURNACES
for HIGH CARBON STEEL WIRE COILS

at The Athenia Steel Division of

NATIONAL STANDARD COMPANY

CLIFTON, N. J.





ENGINEERED AND CONSTRUCTED BY THE

Lee Wilson

ENGINEERING Co., Inc.

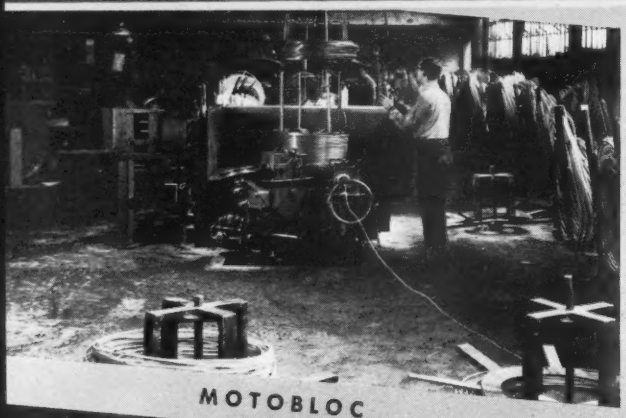
20005 West Lake Road CLEVELAND, OHIO

Telephone ACademy 4670

INDUSTRIAL FURNACES ★ RADIANT TUBE HEATING ★ HEAT TREATING PROCESSES

WIRE AND WIRE PRODUCTS

APRIL 1949



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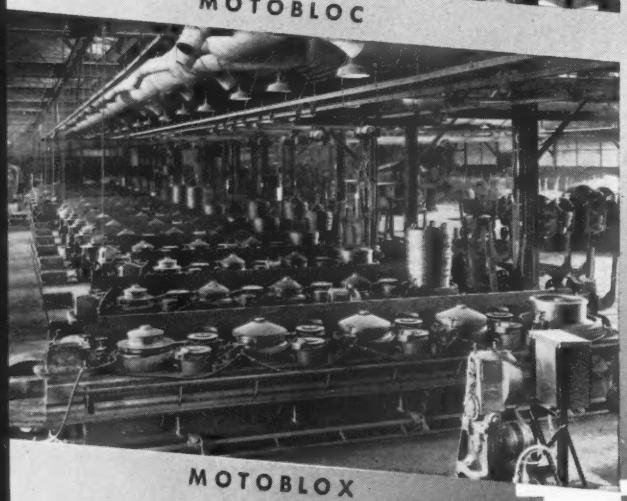

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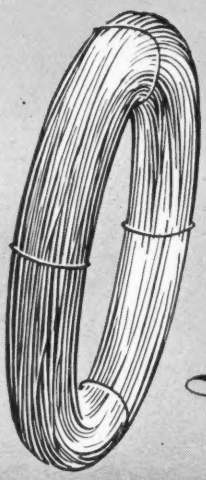

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....the proof of PERFORMANCE!

Vaughn

WIRE DRAWING MACHINERY

"Quick on the Draw!"

VAUGHN MACHINERY

PROFITABLY USED BY LEADING WIRE MILLS SINCE 1871

The end-result of Vaughn Motobloc and Motoblox operation is the wire you want—on schedule! Speed, versatility, safety and dependability are the good Vaughn reasons-why. *Let us consult with you.*

THE VAUGHN MACHINERY COMPANY

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COMPLETE COLD DRAWING EQUIPMENT—Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

WANTED

—WIRE PRODUCERS WHO ARE GUNNING FOR FASTER, BETTER DRAWS EVERY TIME!

If *you're* gunning for faster, better draws, we think you'll be quick to find what you're aiming for in those special-purpose compounds developed by STANDARD.

Mill-tested for top performance, STANDARD Lubricants have what it takes to save you time, trouble and money — not to mention those wire drawing "headaches" so common to the industry.

Leading wire producers have long depended on STANDARD for the kind of help they need to keep production and quality *high*. And not the least of the help they get comes from a STANDARD Service Engineer — rated as a mighty handy man to have at your side when the going gets rough! Next time you need help — or *better wire drawing lubricants* — just sing out for STANDARD.

Standard's wire drawing compounds will produce the finish you require on all grades of steel, copper, or brass: — lime bright, extra bright, dull-coated; or special finishes for welding, lacquering, enamelling or plating.

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WIRE DRAWING LUBRICANTS

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Getting results on cold-heading?

If not, look to the quality of your cold-heading wire. Probably it's a good grade of steel, but may not be the best for the job you're doing.

It pays to be fussy about your needs in cold-heading wire, for the job is half licked when you start with the right steel.

Bethlehem can help in many ways to improve your production of cold-headed items. At your invitation we'll study your products, your equipment . . . and recommend the kind of steel that will perform best. Making the steel for your wire and processing it will then be regulated to meet your requirements, however exacting they may be.

This means close control of such factors as tensile and mechanical properties, grain structure, chemical composition . . . heat-treatment, if required . . . and other considerations that determine how we'll process your steel in our modern wire mills.

Bethlehem cold-heading-quality wire is made to rigid standards. It's sound . . . uniform in analysis, free from injurious surface defects. Thorough inspection at every stage of production is but one phase of the quality-control that's behind every ton we ship.

Whatever your cold-heading job may be, we invite you to consult us. There's no obligation. Just phone your nearest Bethlehem sales office or drop us a line at Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

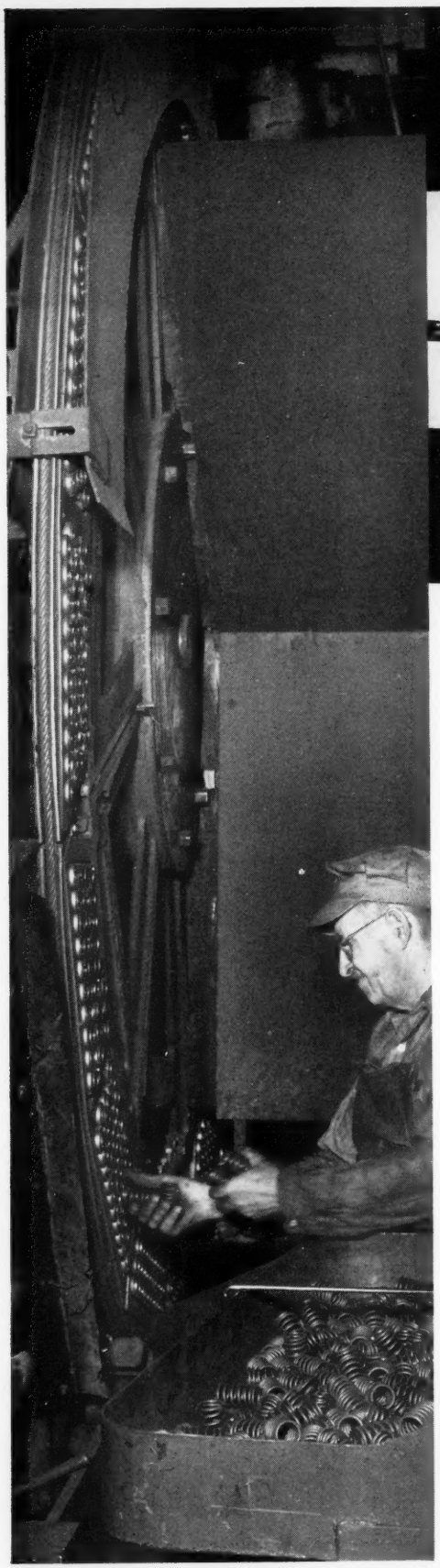
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export distributor: Bethlehem Steel Export Corporation

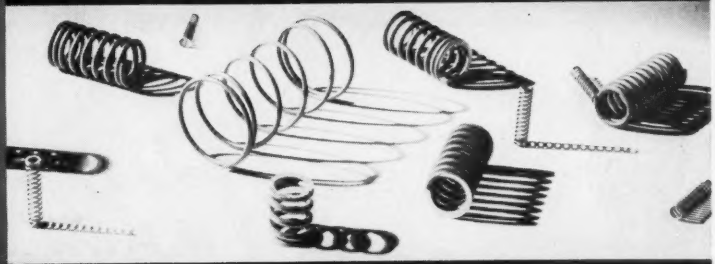
BETHLEHEM STEEL

BETHLEHEM COLD-HEADING WIRE

WIRE & WIRE PRODUCTS, Vol. 24, No. 4, April, 1949. Publication Office, at One Sherman Ave., Jersey City 7, N. J. Executive Office, 300 Main Street, Stamford, Conn. Published monthly by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Secy. and Treas. Subscription price: U. S. $5.00; Canada, $5.00 per year; 50 cents per copy; Foreign, $7.50 per year. Entered as second class matter, January 10, 1949, at the Post Office, Jersey City, N. J., under Act of March 3, 1879.



GRIND MORE
Per Hour . . . For Less . . .



with Fast-Cutting NORTON DISCS!

These Norton discs cut hardened steel fast and cool without danger of burrs, burning or distortion—remain flat and sharp—resist grooving—and require a minimum of dressing—that's why they produce more useable springs per hour and reduce grinding costs.

Especially popular are discs of tough, sharp 57 ALUNDUM abrasive or the sensational 32 ALUNDUM abrasive (Regular or Open Structure) with vitrified bond. They're available in all standard sizes (15" to 72" in diameter), and with all types of mountings (including plate-mounted and inserted-nut).

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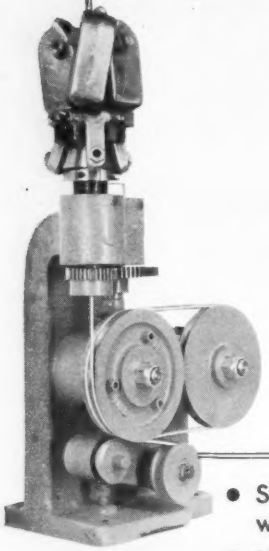
A NEW JLE DEVELOPMENT!

The Wire Industry's First, Practicable

Spiral MARKING MACHINE...

FOR COLOR CODING PLASTIC INSULATED WIRE

SPIRAL STRIPES AS MANY AS 3 DIFFERENT COLORS SIMULTANEOUSLY!



- Striping head is rotated by passage of wire through machine.
- Handles wire diameters from 3/64" to .2". (Capacity to 5/16" dia., at slight extra cost)
- Wire speeds up to 200 feet per minute.
- Economically operated — one person can efficiently operate as many as 6 machines.
- Wire diameter adjustment easily made.
- Simplified cleaning and filling of ink reservoirs.
- 1/32" & 1/16" wide striping wheels for different widths of stripe.
- JLE Type D Inks available in standard colors — white, yellow, orange, red, green, blue, black. (Additional colors on request at slight additional cost)

OPTIONAL EQUIPMENT FOR USE WITH NEW SPIRAL MARKER

MOTOR DRIVEN ROTATOR of striping head — for wires not flexible enough to bend around 4" dia. capstan wheels. Also for use with very light wire to prevent stretching.
DRYING TUBE — available in sectional lengths for quick-drying ink with a forced, spiralling air stream.
STRIPING MACHINE STAND — equipped with wire return guide sheave.
TAKE-UP AND PAY-OFF also available.

SEND FOR STRIPED WIRE SAMPLES AND DESCRIPTIVE LITERATURE

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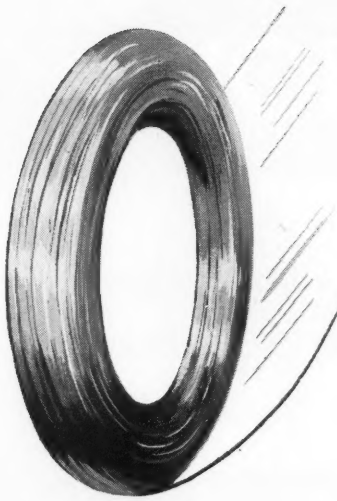
CHASE BRASS and BRONZE WIRE

won't **TWIST**... uncoils **SMOOTHLY**



PERFECT "CAST" ASSURES A PERFECT PRODUCT!

IN the Chase mills very special attention is given to the "cast" of copper alloy wire. Stresses that cause non-uniform uncoiling and twisting are eliminated by extreme care in manufacture.

Chase wire for cold-heading or extruding or to be otherwise plastically formed will flow uniformly. You can thus be sure of a perfect product. And many critical tests on Chase wire take place every day, to assure you bright, beautifully clean wire of even temper . . . wire free from physical defects, accurate in dimensions.

Chase regularly makes 22 different alloys in wire form to suit your every need. Call your nearest Chase Warehouse or Service Office for complete information.

Chase *the Nation's Headquarters for* BRASS & COPPER

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THIS IS THE CHASE NETWORK . . . *handiest way to buy brass*

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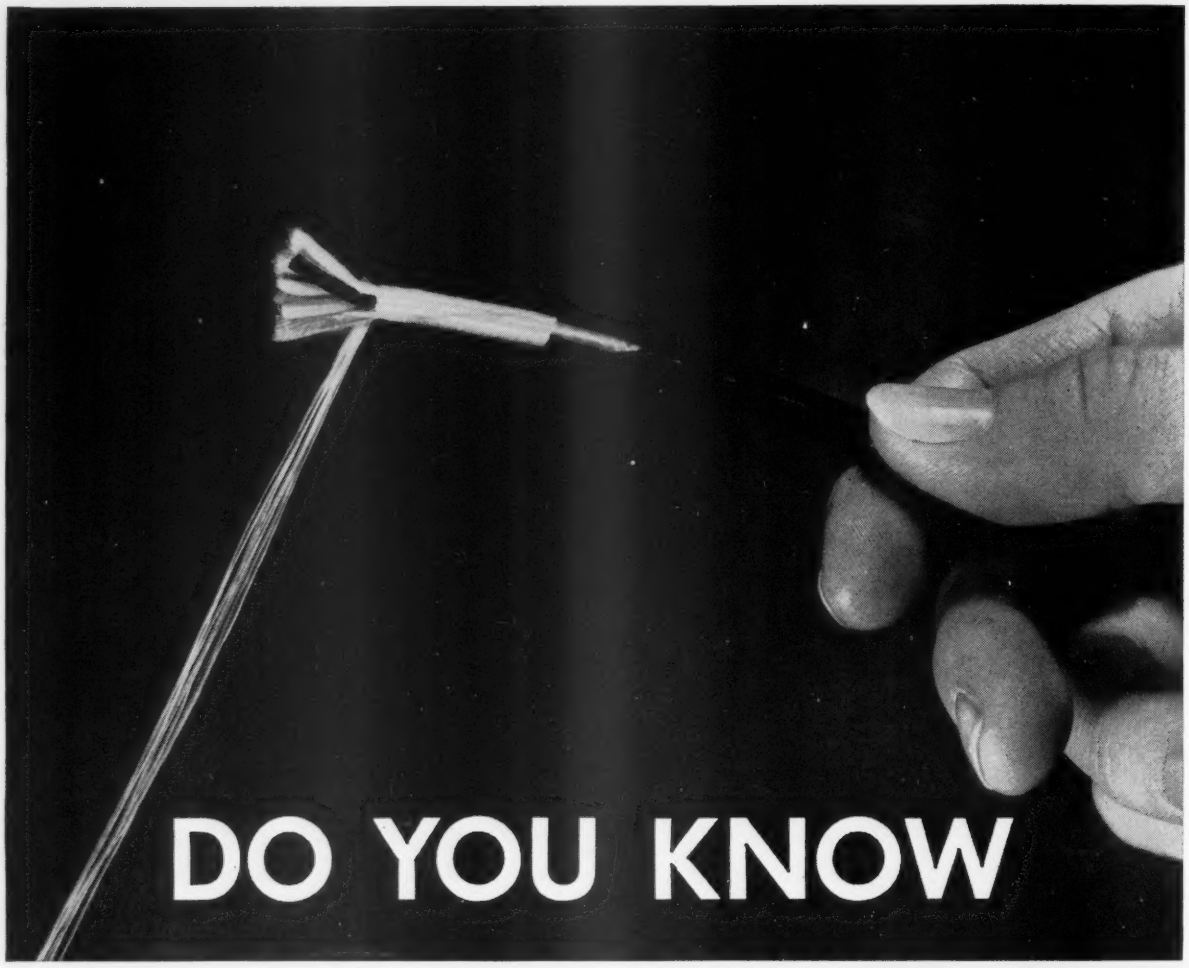

...that braiding or serving costs are lower and efficiency improved *(fewer yarn breaks—fewer package changes)* when you use Fiberglas 150's yarns for separator wraps or braids on flexible cords? In addition, the quality of the cord is improved *(increased flex life).*

For complete information about Fiberglas Yarns, for this and other electrical uses, write Owens-Corning Fiberglas Corporation, Dept. 875, Toledo 1, Ohio. Branches in principal cities.

In Canada: Fiberglas Canada Ltd., Toronto, Ontario.

OWENS-CORNING FIBERGLAS TM. REG. U.S. PAT. OFF. *Yarns*

***Fiberglas is the trade-mark (Reg. U. S. Pat Off.) for a variety of products made of or with glass fibers by Owens-Corning Fiberglas Corporation.**

Stamps of ACCEPTANCE

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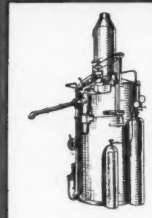
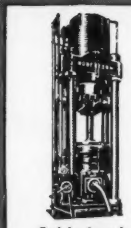
ROME CABLE ROME, N.Y.

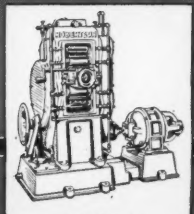
The users of Robertson equipment are leaders in the industry. These companies have been supplying a substantial portion of the world's communication, power and light transmission lead encased cables for many years. It's no wonder then, that they rely on Robertson Equipment. The Robertson Lead Encasing Press, the High Pressure Hydraulic Pump, the Lead Sheath Stripping Machine and the Lead Melting Pots used by wire and cable manufacturers are products of the fine craftsmanship and engineering that have been serving the industry well for many years.



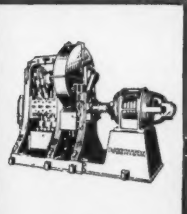
Hose Lead Melting Pot



Cable Lead Encasing Press



Lead Sheath Stripping Machine



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Since 1858

Custom built spools for high speed winding

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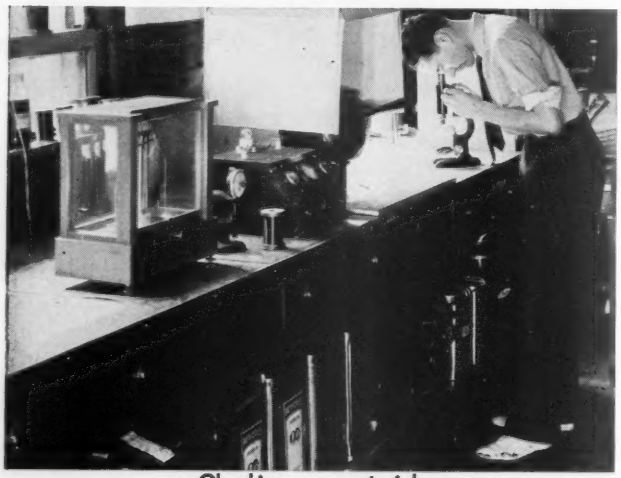

Checking raw materials

Don't "fool around" . . . USE DEPENDABLE WIRE PRODUCTS!

A product, too, is only as strong as its weakest part. Follow the practice of leading designers and engineers by specifying only service-giving wire . . . wire that has built up a reputation for "delivering the goods under fire."

Hudson Wire products, designed for discriminating manufacturers, has just such a reputation in the fine wire field. Offering greater flexibility and tensile strength, perfect laying at higher speeds, new coating methods and reduced coil dimensions without sacrificing electrical values. Hudson Wire products will probably lower your production costs considerably. Check these three points:

QUALITY — All phases of manufacture, from ingot to final processing, are carefully supervised and fulfilled in the same manner you would carry out in your own plant. There are no unimportant phases in the work.

UNIFORMITY — By mercury process tests, our engineers can guarantee perfect uniformity in wire; from the smallest to the largest order. No more variations in consistency, structure or electrical properties . . . every inch of wire exactly as specified, more than meeting your requirements.

SERVICE — If you have a wire problem, our complete design and engineering facilities are at your disposal without obligation. Send your specifications and blueprints for our recommendations; or if you are not quite ready, write for samples of these quality products.

Enameled Copper, Enameled Iron, Enameled Alloy, Enameled Aluminum, Silk Covered, Cotton Covered, Celanese Covered, Glass Fibre Covered, Twisted Multiples, Parallel Multiples, and Litzendraht

HUDSON WIRE CO.

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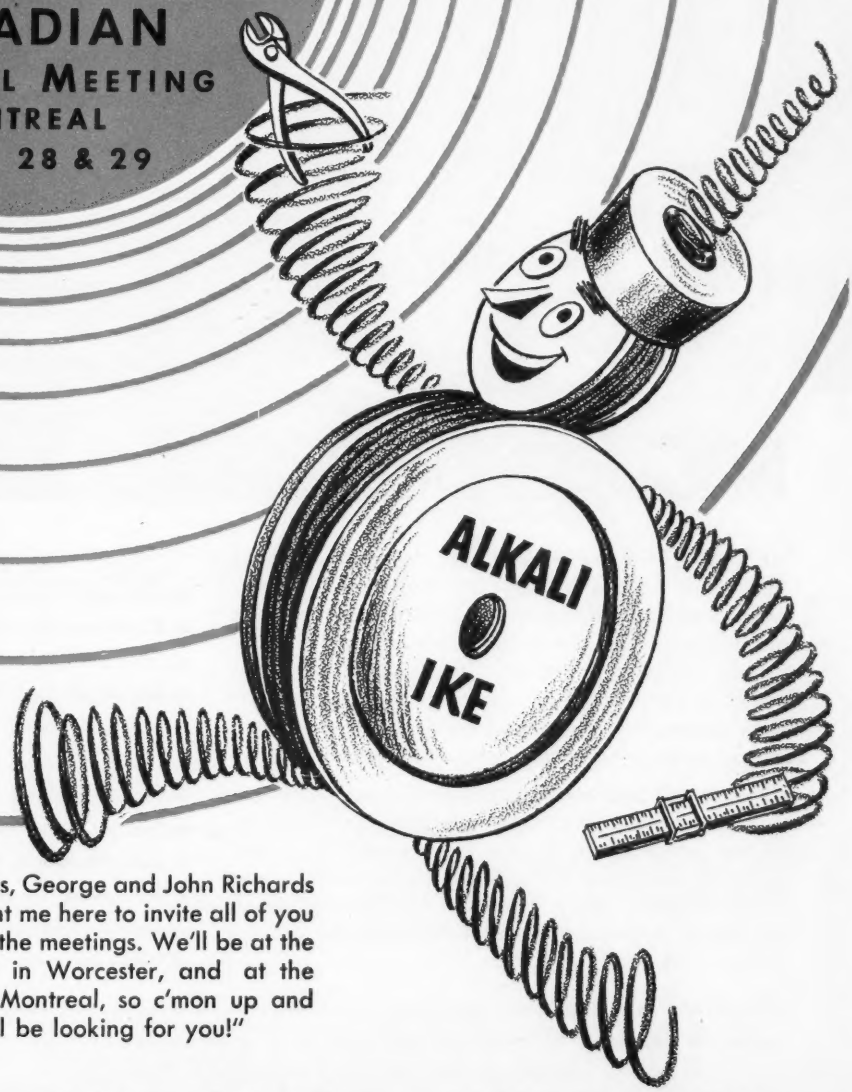
WIRE ASSOCIATION *Meetings*

WORCESTER
REGIONAL MEETING
WORCESTER, MASS., APRIL 22

CANADIAN
REGIONAL MEETING
MONTREAL
APRIL, 28 & 29



"Hiya! My bosses, George and John Richards over at Apex, sent me here to invite all of you to visit us during the meetings. We'll be at the Sheraton Hotel in Worcester, and at the Mount Royal in Montreal, so c'mon up and see us . . . . we'll be looking for you!"

Apex Alkali Products Co.

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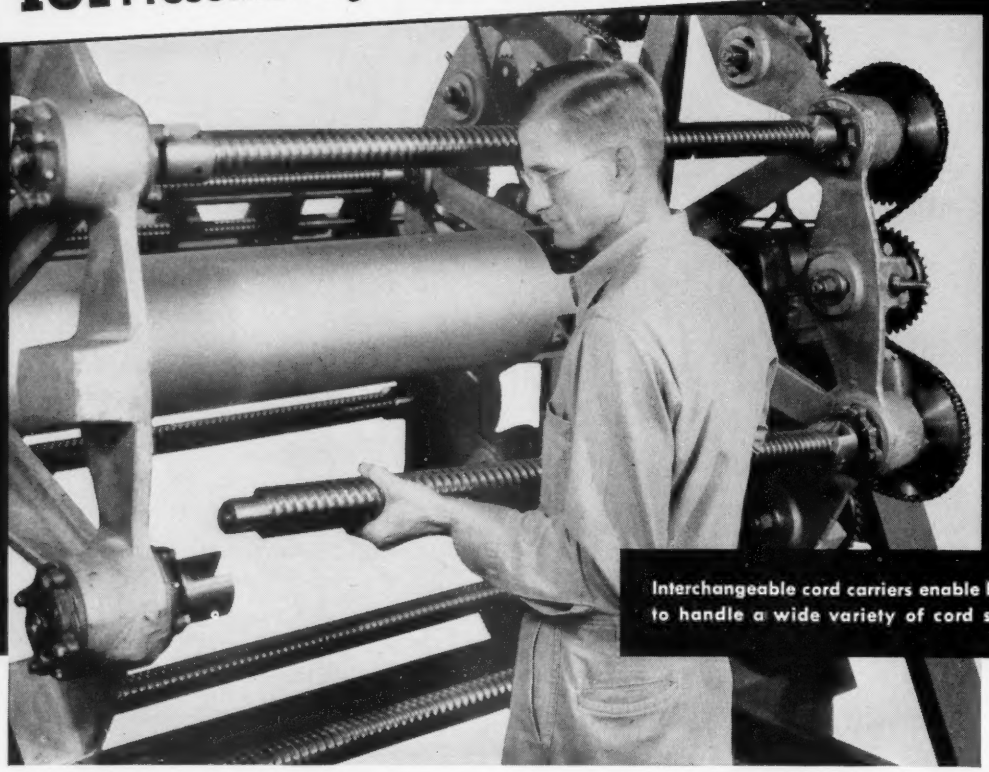
For Better, Faster Rubber and Plastic Jacketing, IOI Presents... *The* SELF-ADVANCING-REEL *Cord Dryer*



Interchangeable cord carriers enable Dryer to handle a wide variety of cord sizes.

High wire scrap loss has long been the nemesis of most continuous rubber and plastic jacketing systems. Underlying cause has been hygroscopic moisture in cords or on the surface of bare conductors. This moisture is transformed into steam at the tuber die, causing blisters and cracks in the cord jacket, reducing insulating properties and destroying diameter control. It also causes substantial losses in production time and production speed.

To overcome this economic waste IOI has developed the Self-Advancing-Reel Cord Pre-Dryer which answers all the problems of drying, back-tensioning, easy threading and space saving in preparing cord for the tuber operation. Some of the outstanding features of this Dryer, demonstrated by units in operation, are listed at the right.

BASIC ADVANTAGES

- Increased Extrusion Speeds
- Blistering Eliminated
- Diameter Control Increased
- Improved Jacket Adhesion
- Reduced Scrap Loss

OPERATIONAL ADVANTAGES

- Threads Itself in 2 Minutes
- Uses Minimum Floor Space
- Automatic Temperature Control
- Automatic Tension Control
- Wide Diameter Range

Complete Information, engineering drawings and analyses of savings effected by this new Self-Advancing Reel Cord Dryer will be sent to you upon request... or an **IOI** engineer will call in person if you prefer.

EXTRUSION SYSTEMS • CONTINUOUS TAKEUPS
ENAMELING MACHINES • PROCESS ANNEALERS

CORD PRE-DRYERS • LACQUERING SYSTEMS
ASBESTOS INSULATING MACHINES

INDUSTRIAL IOI ENGINEERING VERSATILITY **OVENS, INC.**

13825 TRISKETT ROAD CLEVELAND 11, OHIO

ASSOCIATED COMPANY: JAMES DAY MACHINERY LTD., LONDON W.1, ENGLAND

Where do we go from here?

NOW as never before, America stands at a cross-roads. One road is the way of easy promises by which we hope to arrive in the Never-never land of abundance for all and hardship for none.

The other way looks very much like the road we have traveled--the way that built America into the richest, strongest, most envied nation of all time. It is the road built by enterprise and resourcefulness and hard work--and thrift.

As a community leader it is your responsibility to help America choose the road we are to follow.

The Youngstown Sheet and Tube Company

General Offices--Youngstown 1, Ohio
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MANUFACTURERS OF CARBON, ALLOY AND YOLOY STEELS

ELECTROLYTIC TIN PLATE - COKE TIN PLATE - WIRE - COLD FINISHED CARBON AND ALLOY BARS - PIPE AND TUBULAR PRODUCTS - CONDUIT - RODS - SHEETS - PLATES - BARS - RAILROAD TRACK SPIKES.

Important News:

EXTRUDED INCONEL TUBES

The sizes of tubes listed below are those which can be produced from tools regularly carried in stock. Other sizes of extruded tubes can be produced on individual order.

O.D.	Wall	Maximum Length
2-1/2"	5/16"	11' 3"
3-1/4"	1/4"	—
3-1/4"	5/16"	17'
3-1/4"	3/8"	14' 3"
3-1/4"	1/2"	12' 6"
4"	1/4"	22'
4"	5/16"	18'
4"	3/8"	15' 3"
4"	7/16"	13' 3"
4"	1/2"	11' 9"
4"	5/8"	8'
4-1/2"	3/8"	13' 3"
4-1/2"	1/2"	10' 3"
4-1/2"	9/16"	9' 3"
4-1/2"	5/8"	8' 6"
5"	1/4"	—
5-9/16"	1/4"	—
5-9/16"	3/8"	14' 3"
5-9/16"	1/2"	11' 3"
5-9/16"	9/16"	10'
6"	1/4"	—
6"	3/8"	12' 6"
6"	1/2"	10'
6"	5/8"	8' 6"
6-1/2"	1/4"	—
6-1/2"	3/8"	11' 3"
6-1/2"	1/2"	8' 6"
6-1/2"	5/8"	7' 3"
7"	1/4"	—
7"	3/8"	10' 3"
7"	1/2"	8'
7"	5/8"	6' 6"
7-1/2"	1/2"	9' 9"
7-1/2"	5/8"	6'
8"	3/8"	11' 9"
8"	1/2"	9'
8"	5/8"	7' 6"
8-1/2"	3/8"	—
8-1/2"	1/2"	—
8-1/2"	5/8"	6' 9"
9-1/4"	7/16"	—
9-1/4"	1/2"	—
9-1/4"	5/8"	—

Annealing furnace for treating welded alloy tubing, installed at the plant of the Metal Forming Corp., Elkhart, Ind. INCONEL tubing shown is 5-9/16 in. with 1/4 in. wall. The furnace operates continuously, 24 hours a day, 7 days a week. A hydrogen-nitrogen atmosphere is used. Temperatures range 1450° to 2000° F., and from these INCONEL tubes, the Metal Forming Corp. has received over 11,000 hours of service life.

Now you can have all the special advantages of INCONEL* *plus* the advantages of seamless, extruded tubing . . . for large as well as small installations.

Here's why!

INCONEL—the heat-resistant, corrosion-and-oxidation resistant INCO Nickel Alloy—is now being extruded in tubing with outside diameters of all the way from 2½ to 9¼ inches. Wall thicknesses range from ¼ to ⅝ inches.

Just glance at the table. With such a variety of sizes at your command, you can meet almost any furnace design requirement. Remember, too, that special lengths and dimensions can often be produced to fit specific conditions. You can get INCONEL in standard mill forms, as well as tubing.

Whenever you need a metal to withstand extreme heat, oxidation, corrosion, destructive atmospheres . . . investigate INCONEL. You will discover why this unusual INCO Nickel Alloy is making performance history in the heat-treating field.

Send for your copy of: *"Inco Nickel Alloys for Long Life in Heat Treating Equipment."*

EMBLEM OF SERVICE

INCO TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall Street, New York 5, N.Y.

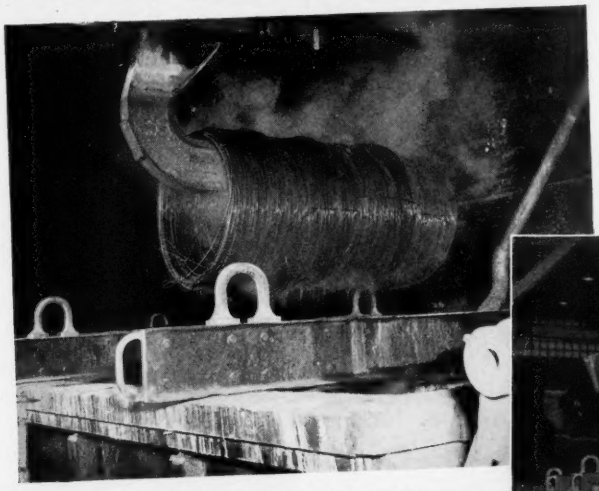
SPECIFY **INCONEL*** — FOR LONG SERVICE AT HIGH TEMPERATURES

(80 NICKEL-14 CHROMIUM)

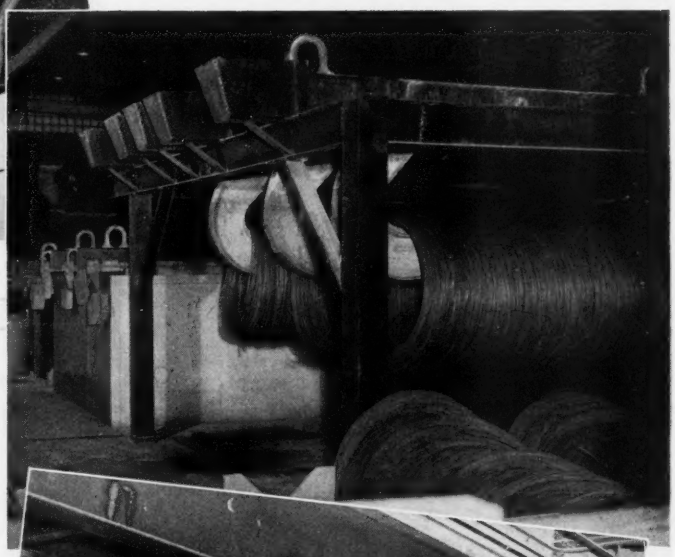
*Reg. U. S. Pat. Off.

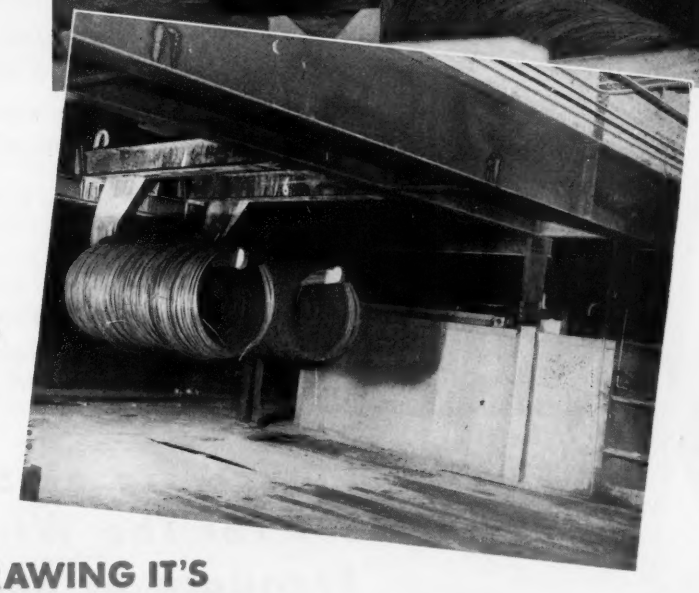
FROM DIP TO DRAW IN 20 MINUTES!

No Liming... No Baking



with MAGNUS METAL COAT #267





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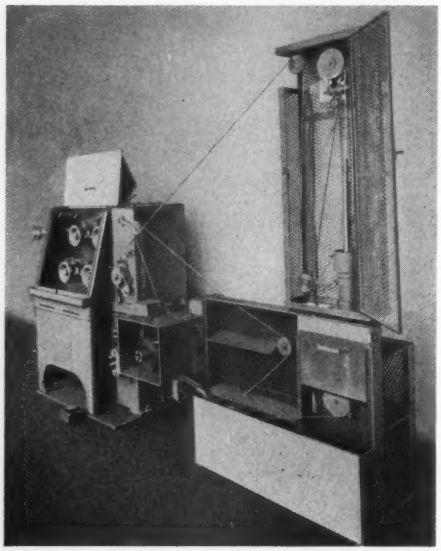

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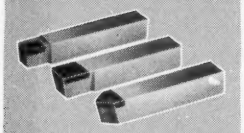

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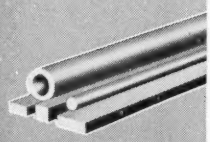

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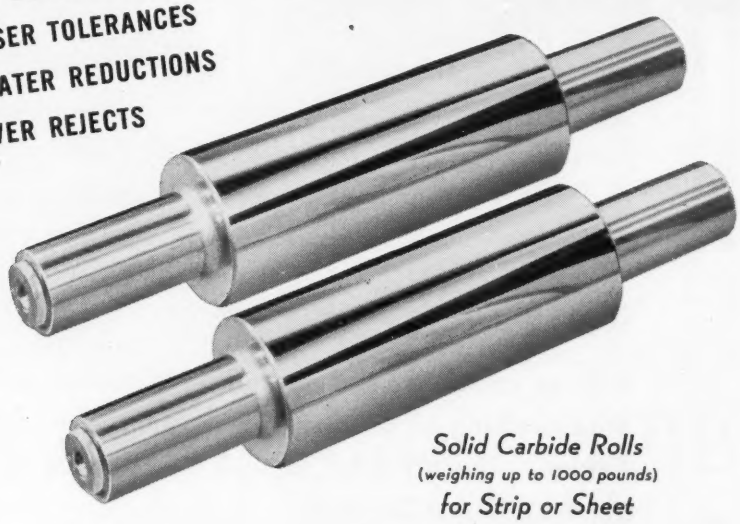

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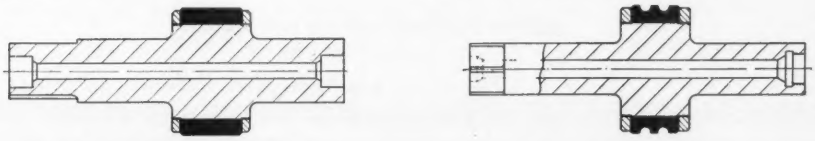

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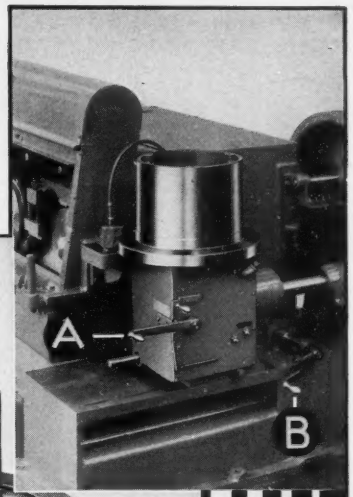

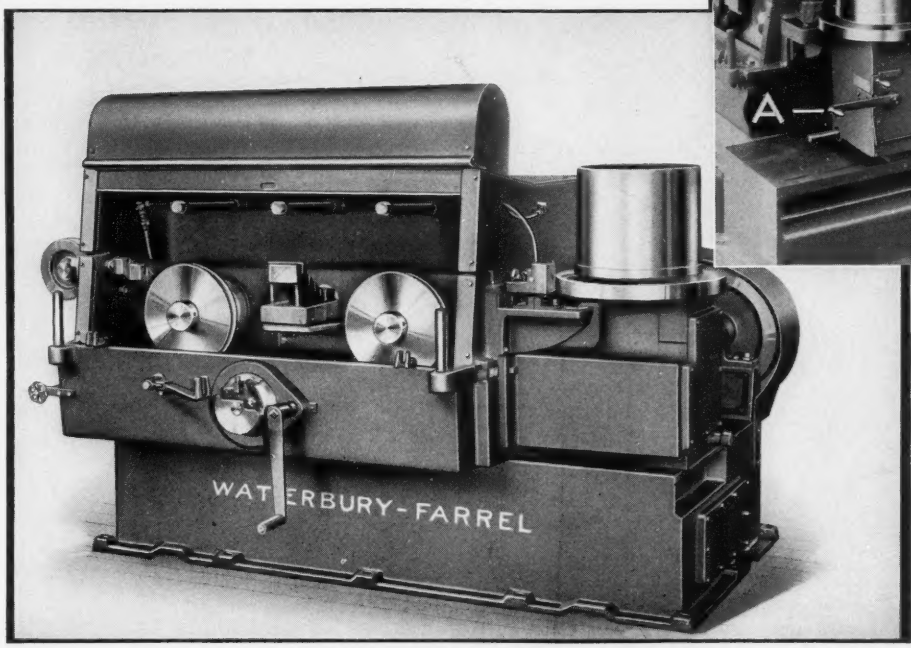

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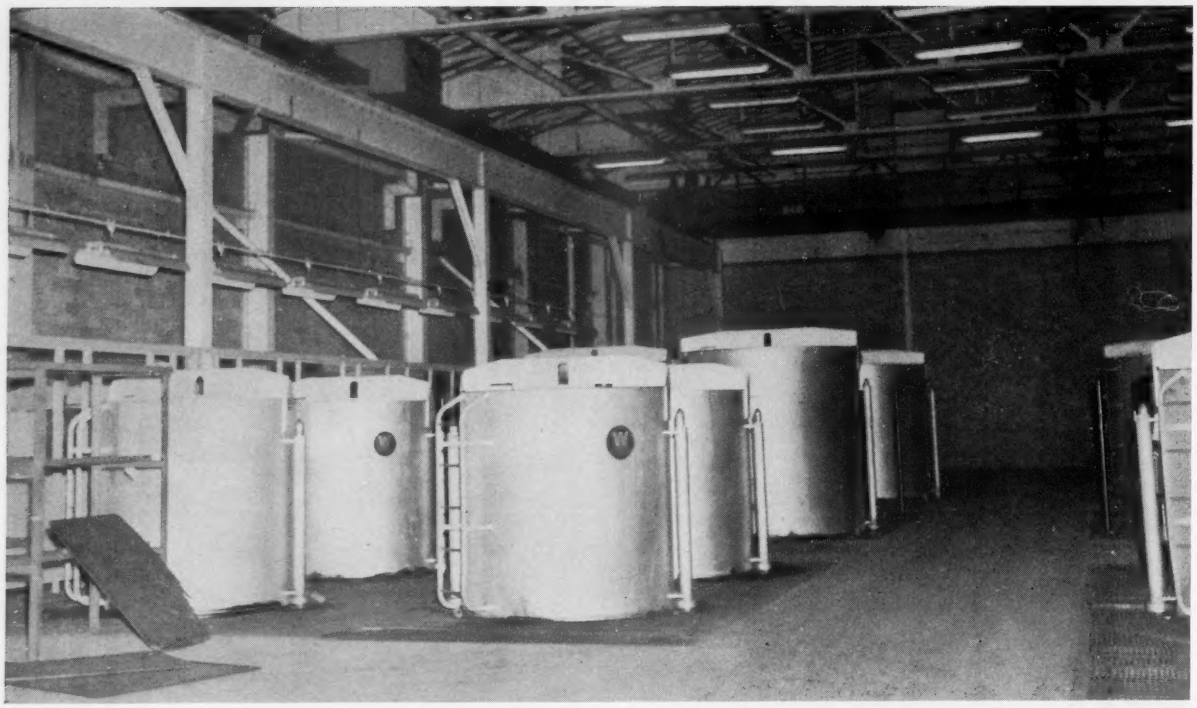

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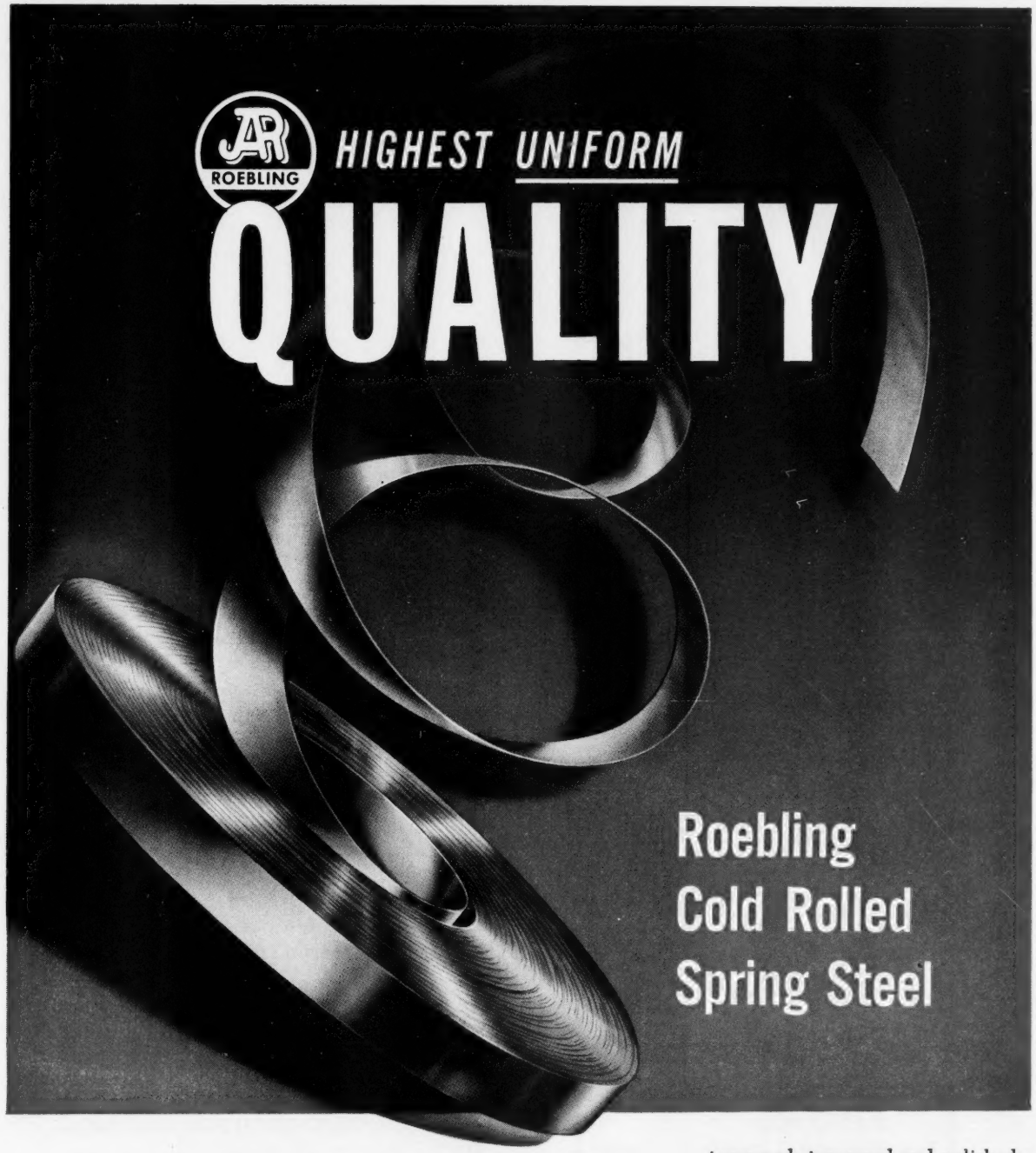

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The Wire Outlook

The Youngstown Sheet and Tube Company, through a radio program, is incorporating a series of brief talks intended to "sell America" the principles that made it a great and free country. We reproduce one of these scripts as a type of service that well might be widely duplicated by American industry:

> "The Constitution of the United States of America is one of the greatest documents in all history. Under its protection, we have achieved greater freedom for the individual and greater spiritual and material benefits than have the peoples of any nation in all recorded history. Under this constitution our government is created and operates in accordance with its precepts. Under this constitution, which grants so much to the free-men who live by it, our government cannot make a profit. It can support only those who are on its payrolls. Government produces no wealth of any kind. It produces no clothing, no food, no houses, no steel, no automobiles. It is the people who support government. It is business which supports government. Every dollar spent by government comes from incomes of its people or its business. This is a truth that is easy to understand. Yet: in spite of this self-evident truth we have individuals and groups insisting that they be supported by government. Where is the necessary money to come from? That, too, is an easy question to answer. FROM YOU! From your neighbor! From all your friends! Even if it comes from business it indirectly must come from your pocket for added taxes levied upon business must be added to selling cost—paid by you. There are certain powerful pressure groups in America constantly insisting upon more and more government spending. Remember, that under our system of government we—the individuals—are responsible. In theory at least—and actually under our constitution—we govern ourselves. The time is rapidly approaching when each of us must become vitally interested in our national expenditures. We may find ourselves in the same predicament as those whom we are doing our utmost to help today. Who will be left to help us?"

Most observers will agree that business has stepped down to a lower level that more nearly approximates the normal. If this be true, the adjustment from post-war boom days will hardly justify even the term "recession". As backlogs are worn down, a healthier basic condition should result in more vigorous selling campaigns and continued effort to produce with ever greater efficiency. A leveling off of the winter slide should start this month, with good business continuing through the Fall.

The Administration seems to be encountering a satisfactory resistance to its efforts to repeal the Taft-Hartley Law and re-enact the Wagner Act. The country and Congress seem well aware of the fact that the present law tends to curb the power of the union leaders, at the same time protecting the rights of individual workers. No action is likely to be taken hastily in spite of the great pressure put upon Congressmen by "labor". The Supreme Court's recent decision upholding states' laws banning the closed shop has been a timely and effective deterrent to unwise legislation—for the state laws remain valid regardless of Federal action.

While labor's drive for further wage increases seems to have been nipped in the bud by falling prices and increasing unemployment, union heads are nevertheless pushing for other benefits that would have the same effect and that appear at the moment to be untimely. These are higher minimum wages, guaranteed yearly incomes and a shorter work-week. Splendid ideas in theory, but poor in practice, if the net result is higher costs.

There has been little change in the steel rod and wire supply situation. Those mills needing rods, although slight improvements are reported here and there, feel that the balance between supply and demand is mighty slow in coming. As the steel industry is still working on long-standing backlogs, a little more patience will be necessary before rods will be freely available.

Nail supply has become easier and, partly due to decreasing exports and partly because of the slackening of building through the winter, stocks for spring building programs are more adequate.

While things look better, there should be a never-ending vigilance on the part of all right-thinking Americans to checkmate the ceaseless efforts of left-wingers and those extravagant "do-gooders", who spend without reckoning the cost. Citizenship carries with it as grave responsibilities today as in the days of our forefathers.

—from the Editor's Desk.

Mighty handy when it rains . . .

In boom times a mill may get by with old wire drawing machines. BUT as competitive selling returns, the mill caught with worn-out, obsolete equipment will find the going tough. Why not get ready now? Start replacing with

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Vol. 24 APRIL, 1949 No. 4

Designated as

Official Publication By The Wire Association

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Vol. 24 APRIL, 1949 No. 4

The Fatigue Problem in Metals with Special Reference to Wire Materials

By John N. Kenyon
Consulting Research Engineer
Princeton, N. J.

The first of a series of papers on this important topic which will be published in Wire & Wire Products.

Historical

THE phenomenon of fatigue failure in metals came forcibly to the attention of engineers in 1848 when 'straight-across' breaks were experienced in axles on the Prussian railroads. Previous tensile and bend tests had demonstrated that the metal had ample ductile reserve, and yet the service breaks were definitely of a cast-iron nature.

★ ★ ★

THE logical conclusion was that this ferrous material had undergone some internal change, probably crystalline, due to the stress reversals under heavy loading conditions. These methodical raliway engineers were thoroughly convinced of crystalline change by the appearance of the service breaks, as contracted with the **fibrous** appearing breaks obtained by tensile methods. Besides, what further was needed when large crystals could be distinguished with the unaided eye.

★ ★ ★

THE renowned **August Wohler** established a metals testing laboratory at Berlin in 1852 and in 1870 "—published the results of his classical experiments on iron and steel subject to repeated, direct, torsional and bending stresses"(1). His findings amply confirmed the prevailing opinion that metals will crystallize and fail under a variable stress condition. Hence the origin of the term, Fatigue of Metals.

★ ★ ★

AT the turn of the century, and the advent of metallography, discovery was made that 'fatigued' metals do not undergo crystalline change in structure. Microscopic examinations made close to the plane of fatigue break showed that little, if any, change had taken place. This called for an entirely new theory of fatigue failure so the 'phenomenon of the spreading crack' was substituted. This explanation is commonly accepted today although some recent findings in the non-ferrous field may call for modification.

[1]) H. J. Gough, "The Fatigue of Metals" (1926) p-4.

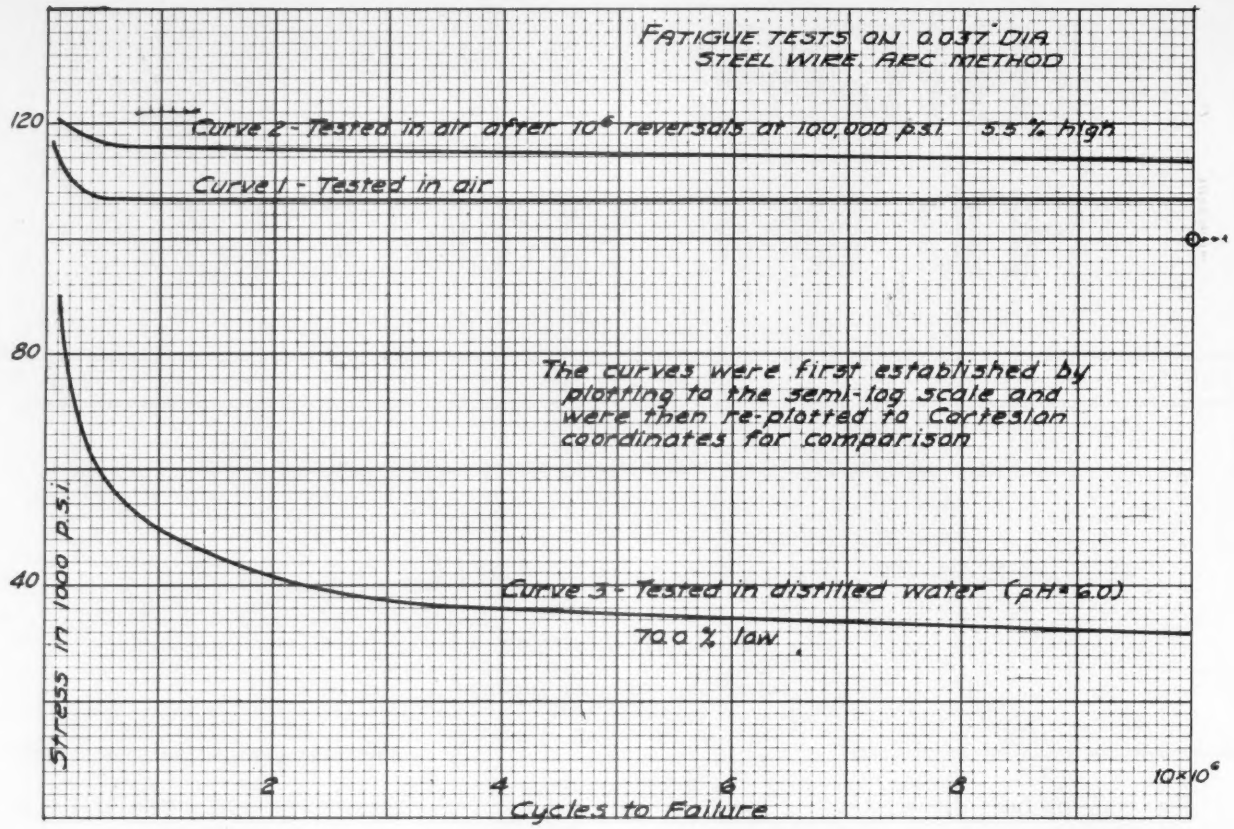
★ ★ ★

THE spreading-crack theory of fatigue failure requires the concept that metals behave much like glassy materials when subjected to a variable stress within the elastic range. Thus an incipient fatigue crack, sub-microscopic in origin, will develop and spread at a slow uniform rate. Ultimate failure will result when the cross-sectional area has been sufficiently reduced. A more elementary conception is that of the crack in a china cup, used each morning for coffee. This crack expands and then contracts under each heating effect and, after one year, will be noticeably deepened.

★ ★ ★

Some Twentieth Century Fatigue Studies

THIRTY years ago, just two studies considered worth listing had appeared on the subject of fatigue failure. By 1941, some 450 papers had been published and the Fatigue of Metals had become es-


FATIGUE TESTS ON 0.037" DIA. STEEL WIRE. AEC METHOD
120
Curve 2 - Tested in air after 10^6 reversals at 100,000 p.s.i. 5.5 % high
Curve 1 - Tested in air
80
The curves were first established by plotting to the semi-log scale and were then re-plotted to Cartesian coordinates for comparison
Stress in 1000 p.s.i.
40
Curve 3 - Tested in distilled water (pH = 6.0)
70.0 % low
2
4
6
8
10×10⁶
Cycles to Failure

tablished as a fruitful field for scientific research.(2)

★ ★ ★

ONE of the papers, referred to above, was the classical works of **August Wohler.** The other paper was published in England in 1917 by Dr. **B. P. Haigh** and was entitled, "Experiments on the Fatigue of Brasses".(3) Haigh found that the fatigue limit of the non-ferrous alloys is lower when corrosion and variable stress occurs simultaneously than when corrosion precedes the stress. The far-reaching importance of this discovery can be better evaluated by considering the later works of Dr. **D. J. McAdam,** formerly with the U. S. Naval Experimental Station.

★ ★ ★

IN 1926, McAdam turned a stream of tap water on a fatigue specimen to determine the effect of lowered temperature. An abnormal lowering of the fatigue limit was encountered which indicated the advent of some chemical effect. This discovery led to the publication of a long series of papers on 'corrosion-fatigue' and their influence on other investigators in the fatigue field was profound.(4)

★ ★ ★

McADAM demonstrated that while the fatigue limit of steels may be increased by tempering and alloying, (in nearly direct proportion to the increased tensile strengths), this gain is completely lost under corrosive conditions. In fact the corrosion-fatigue 'limit' of the whole range of carbon and ordinary alloy steels falls to the narrow range of 12,-500 to 30,000 psi.(4)

★ ★ ★

THE corrosion-fatigue phenomenon is comparatively simple in principle. Practically all metals develop an 'invisible protective film' which tends to bring further corrosion to a standstill. Otherwise the metals might revert to the ore state within a comparatively short time. Now under variable stress this film may be damaged or destroyed because of its brittle nature. Under variable stress condition, in corrosive environment, a microscopic pitting is bound to result. These pits are the incipient beginning of fatigue cracks which, once started, proceed progressively until there is ultimate failure.

★ ★ ★

IT is generally recognized that corrosion-fatigue is galvanic in nature wherein some inclusion, (crystal plane or boundary), may become **cathodic** to the adjoining metal which would be **anodic**; or vice versa.

★ ★ ★

IN the late twenties the attention of the railroad and steel interests was called to an indicated upward trend in rail fatigue breaks. This trend, though not accompanied by an increase in fatal accidents, was nevertheless an indication of a future potential danger. Conse-

---

2) Battelle Memorial Institute, "Prevention of Failure of Metals under Repeated Stress" (1941) p-241.
3) J. Inst. Metals, v 18, 1917 pp 55-86.
4) J. J. Gough, "Corrosion-Fatigue of Metals" J. Inst. Metls (1932).

quently a comprehensive investigation was undertaken at the University of Illinois under the direction of **H. F. Moore.** This important study (probably costing some $500,000), together with the work performed by the A.R.E.A. and the Sperry detector cars has largely eliminated rail fatigue failures from any contribution to railway accidents.

★ ★ ★

THE study was most opportune in view of the increased tonnage contingent on the War transportation and its importance is best summarized in a statement by **A. G. Trumball** of the Chesapeake and Ohio Railroad: "A research typical of the very best that can be done and one of tremendous importance to the railroads of America."(5)

★ ★ ★

IT is interesting to note that this rail failure problem was not associated with corrosion-fatigue, but was due to the presence of minute "shatter cracks" within the railhead. The fatigue cracks developed from within and worked outward. Once the metallurgy of the mill practice had been corrected, no further difficulty was encountered.

★ ★ ★

THE peculiar nature of rail fatigue failures has no direct bearing on the wire problem. However, due consideration must be given to the important study because of its far-reaching importance in the phenomenon of fatigue behavior.

★ ★ ★

Study of Wire Fatigue

THE data contained in the accompanying graph Fig. 1. were obtained on cable grade steel and with the Arc fatigue machine, whereby a considerable length of wire is subjected to the fatigue effect. (6 7)

★ ★ ★

THE curves were first established by semi-logarithmic plotting and were then re-established with Cartesian plotting to give a better perspective.

★ ★ ★

CURVE 1. These data were obtained in air and under practically non-corrosive conditions. The unusually high fatigue limit of 107,000 psi indicates very good grade wire.

CURVE 2. This curve was obtained with five unbroken fatigue specimens which had first been subjected to 10 million stress reversals at 100,000 psi. The increase of 5.5 per cent in the fatigue value indicates that steels do not 'fatigue' but tend to improve in the endurance properties, under variable stress; providing there is absence of corrosive effect.

CURVE 3. These data were obtained by carrying out the tests in distilled water. The endurance value has fallen off some 70 per cent after 10 million cycles and there is no indication that the curve is becoming asymptotic (horizontal) in trend.

★ ★ ★

IT is interesting to note that the broken specimens were visibly bright when taken from the distilled water bath; but the microscopic revealed a multitude of corrosion pits.

★ ★ ★

Future Considerations

A SECOND paper of this series will trace the development of wire fatigue testing machines from the standard methods, which required machined and reduced test specimens.

★ ★ ★

THE Third and Fourth papers will consider further the all-important problem of corrosion-fatigue in wire materials. An attempt will be made to give some lead on how the problem should be attacked.

★ ★ ★

5) H. F. Moore, "Joint Investigation of Fissures in Railroad Rails" (Progress Reports 1931-1944) BULLETINS of the University of Illinois.

6) John N. Kenyon, "The Rotating-Wire Arc Fatigue Machine for Testing Small Diameter Wire" PROCEEDINGS, Am. Soc. Testing Mats., Vol. 35, Part II, p. 156 (1935).

7) John N. Kenyon, "A Corrosion-Fatigue Test to Determine the Protective Qualities of Metallic Platings" PROCEEDINGS, Am. Soc. Testing Mats., Vol. 40, p. 705 (1940).

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ELECTRIC EQUIPMENT FOR WIRE WINDERS

(Part II)

By J. G. Roby
Steel Mill Division,
Industrial Engineering Divisions,
General Electric Company,
Schenectady, N. Y.

and

H. R. Lloyd
Machinery Division
Industrial Engineering Divisions,
General Electric Company,
Schenectady, N. Y.

TYPES OF DRIVES

The second part of an analysis of motor and power requirements for wire winders.

Application Type 1 - Torque Motor Systems

SO-CALLED "torque motors" are motors capable of operating continuously at speeds substantially below the normal or synchronous speed of the motor. Depending on design, these motors can be stalled for various lengths of time.

★ ★ ★

A-C Drives

THESE motors are used for Application Type 1, where the wire speed is fixed by some other part of the process such as the capstan. The gearing is so arranged that for maximum wire speed and minimum reel diameter the motor is still operating below its synchronous speed. In other words, the motor is trying to run faster but the load holds it back. By utilizing the characteristics of the motor inherent in its design, along with the proper control, it is possible to obtain a speed-torque characteristic that will be accurate enough for many wire winder applications.

★ ★ ★

FIG. 5 shows a wound rotor induction motor used as a torque motor. A block of resistance is used in the secondary to obtain a straight line speed-torque characteristic, as shown by line A. Then, by varying the primary voltage, a family of curves is obtained with slopes that approximate the constant horsepower requirements of a particular winding application. For a combined reel speed change of 4-1 for build-up and wire speed change, it would be normal to expect a maximum tension error of approximately plus or minus 35 per cent provided any constant torque loads did not overshadow the constant horsepower characteristic. For smaller build-up or wire speed range the error would be correspondingly smaller. Such a drive would normally be satisfactory over a 5-1 tension range. The principal disadvantage outside of the limited operating range is that this system has little forcing action and should not be used where rapid acceleration is important.

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ESSENTIALLY the same speed torque characteristics can be obtained by applying full voltage to the stator and varying the secondary resistance. Such a system has the advantage of eliminating the primary auto-transformer but

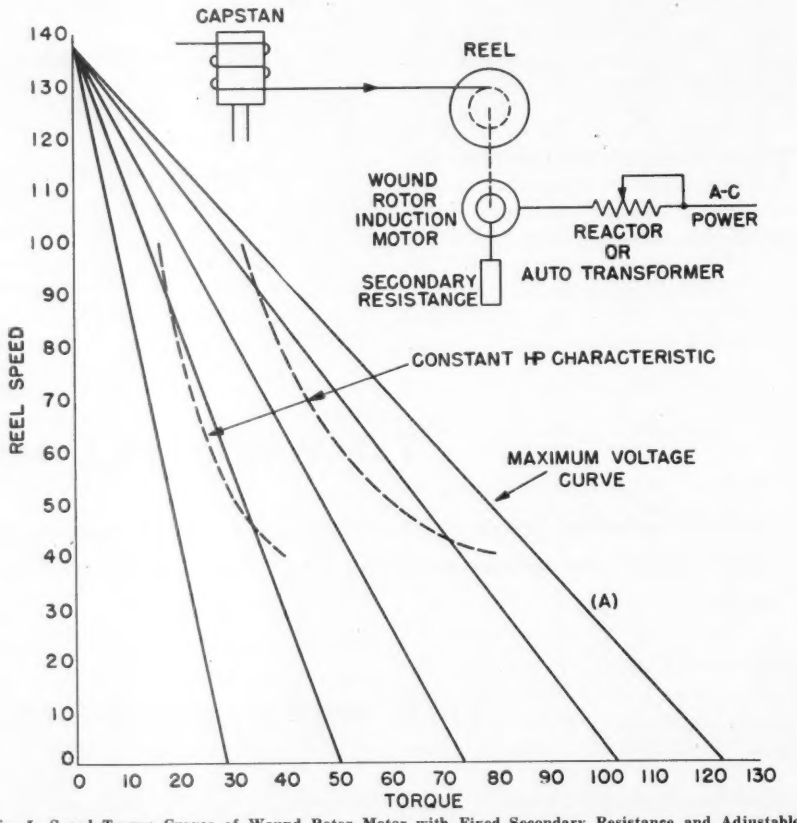

Fig. 5—Speed Torque Curves of Wound Rotor Motor with Fixed Secondary Resistance and Adjustable Primary Voltage

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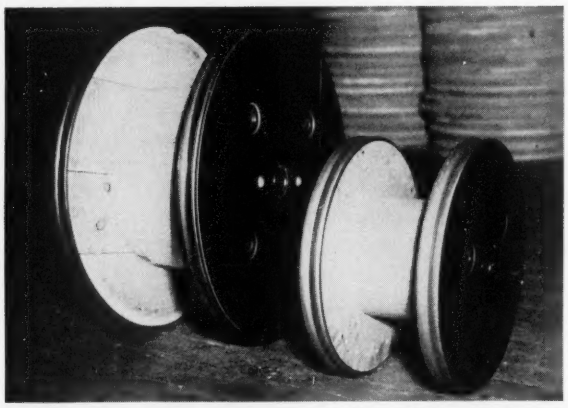

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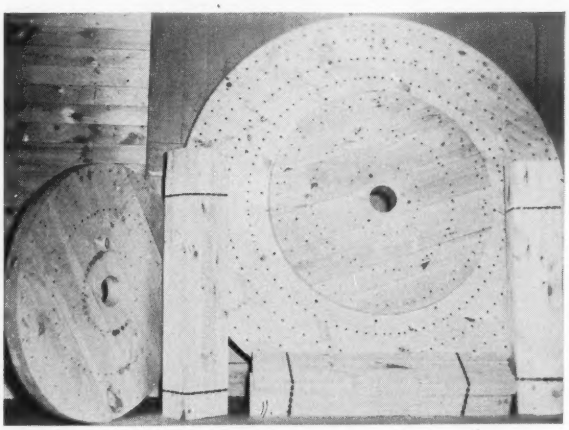

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is less efficient than the other system.

★ ★ ★

THE same characteristics can also be obtained by varying the primary voltage applied to a specially built high resistance rotor induction motor that gives the straight line characteristic, Line A (Fig. 5). Such designs usually require oversized frame sizes larger than the comparable wound rotor motor because the rotor loss must be dissipated within the motor, rather than in the external resistor. For that reason we find that these drives are practical only for those applications where the tension horsepower is relatively small. Where the conditions justify their use, these drives are attractive because of their low cost. Fig. 6 shows a typical application of individual wire winders with a-c torque motors and voltage control for tension adjustment.

★ ★ ★

IN a drive of this type the stalled torque will be in excess of the operating range torques. If the drive is to be stalled, care must be exercised so that the stalled tension is not excessive, particularly with the smaller reel build-ups.

★ ★ ★

IN selecting a torque motor for a particular reeling application, it is not correct to expect the motor to have a comparable frame size to the tension horsepower calculated by the formula:

$$hp = \frac{\text{tension} \times \text{fpm}}{33000}$$

even though the motor will not be required to stand stalled. This is because the motor will be operated well below its synchronous speed. To get an approximate idea of the comparable horsepower frame size, the horsepower required above should be multiplied by the ratio of synchronous speed to full reel speed. If stalled torque is required, the frame size will be even larger. Because of this, it is difficult to give a torque motor a horsepower rating, and consequently they are often rated in torque units.

★ ★ ★

MANY times a group of wire winders will be reeling wire from a process in which one or two capstans are setting wire speed for the entire line-up. Fig. 7 shows such a winding installation. Here each reel is driven by an a-c torque motor with multiple voltage control for tension adjustment.

★ ★ ★

D-C Drives

FIG. 8 shows a d-c series motor drive. This type of drive was first used successfully and extensively for reeling in the textile industry. This system is quite inefficient but produces a speed torque characteristic curve which very closely approaches the constant horsepower curve desired. Tension is adjusted by a series rheostat over 4-1 range and the drive will normally accommodate a reel build-up of as much as 6-1 and a wire speed range of as much as 4-1. The expected accuracy would be approximately plus or minus 25 per cent. The speed torque characteristics are also shown in Fig. 8. If a greater range of tension is desired, a rheostat may be added in parallel with the armature. This gives a better constant horsepower curve in the region of Curve A (Fig. 8). A greater range of speeds may be obtained by operating the motor on adjustable voltage.

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A GROUP of d-c series motor driven reels and their control equipment is shown in Fig. 9. The wires pay off from the large reels shown at the bottom of the pic-

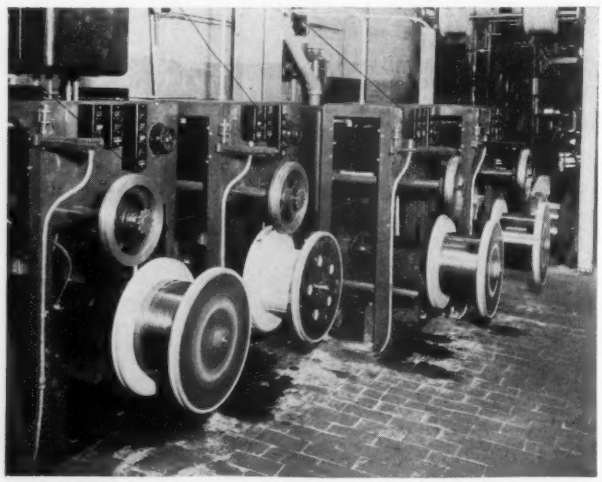

Fig. 6—Individual Wire Winders with A-C Torque Motors and Voltage Control. * * * * * * *

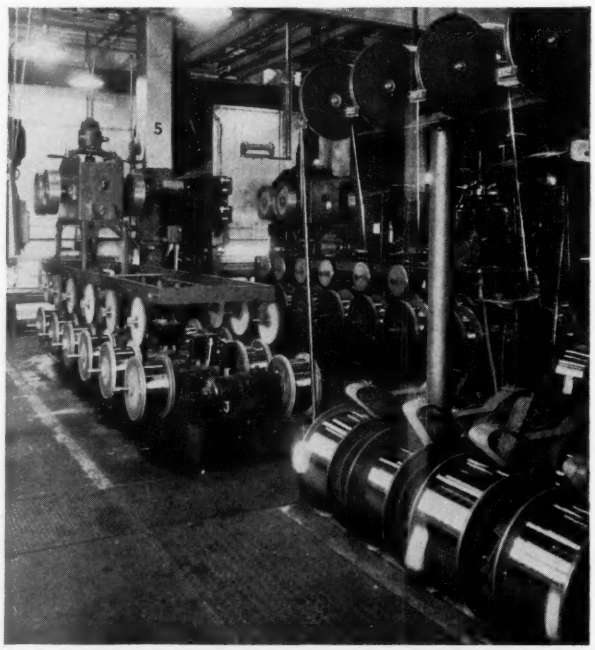

Fig. 7—Group of Wind-up Reels using a-c Torque Motor Drives with Common Voltage Control for Tension Adjustment. * * *

ture and after being processed are wound up on the spools shown in the middle of the photograph. Wire speed is set by the multiple sheave capstan shown directly to the left of the windup spools and the windup tension is adjusted by controlling the voltage to the motors. The adjustable voltage control panels are shown at the left of the photograph.

★ ★ ★

Constant Current Systems

THE fact that constant tension can be held by holding constant horsepower provides a tool for solving winding problems, since:

Motor Voltage x Motor Current x Constant = hp

★ ★ ★

THEREFORE, where the motor voltage is contant, constant tension reeling can be accomplished by holding the motor current constant. In order to hold the current of a d-c motor constant and still have the voltage constant for different reel build-ups, the controlling must be done by adjusting the motor field. As the reel builds up, the driving motor is obliged to run slower because of the increased diameter. If the motor should slow down with the same field strength, the motor counter emf would decrease and this would permit a greater current to flow. However, if the motor field is increased at a rate designed to maintain the counter emf constant, then the current is held constant. As the motor slows down with the increasing reel diameter, the torque output is increased by virtue of the field strengthening. This satisfies the requirement for constant tension at the larger diameter.

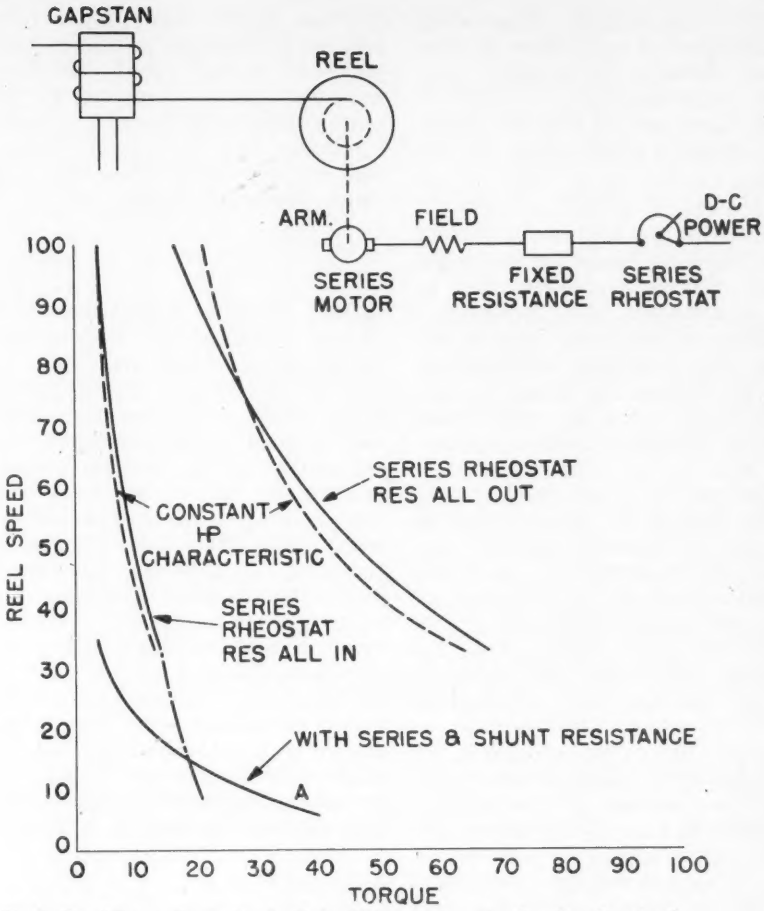

Fig. 8—Speed-Torque Curves for d-c Series Motor

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THE discussion above considers the case of a constant wire speed. When the wire speed is ad-

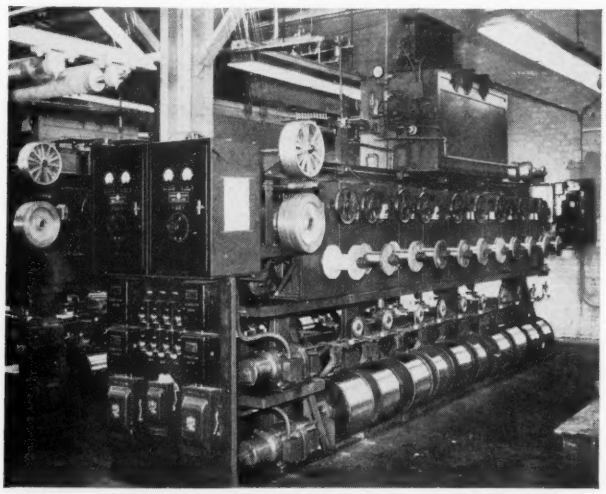

Fig. 9—Group of Wind-Up Reels in Center of Picture with d-c Series Motor Drives and Common Voltage Control.

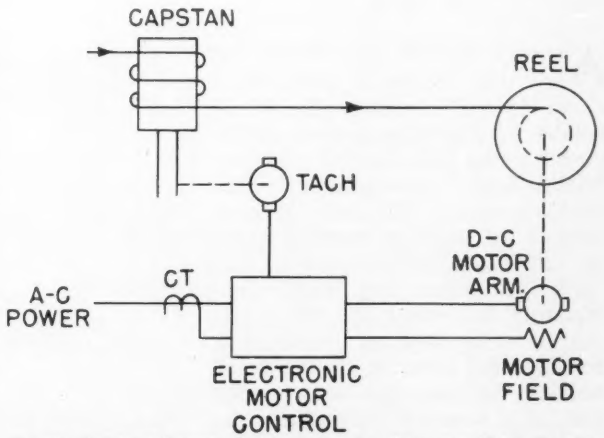

Fig. 10—Constant Current System using d-c Electronic Motor Control.

justable, the applied voltage must be adjusted in proportion to wire speed because for constant tension, the horsepower is proportional to speed and to voltage. Thus, wire speed is proportional to voltage.

★ ★ ★

FIG. 10 shows a constant current system utilizing an electronic motor control equipment such as the Thy-mo-trol. The Thy-mo-trol consists of electronic control circuits and controlled rectifiers using thyratrons for armature and field supply to a d-c motor permitting operation from a-c power. In this system, the electronic motor control is operated continuously against its current limit to obtain the constant current feature. For a given wire speed the armature voltage is held constant and the current-limit circuit adjusts the motor field to hold the current constant. The current signal for the unit is obtained from a current transformer in the a-c line. For conditions of varying wire speed, a tachometer generator driven by the capstan supplies the electronic motor control with a signal of wire speed. The armature voltage is then adjusted to follow the tachometer signal.

★ ★ ★

A GENERAL rule to follow is that the maximum range of tension adjustment for a constant current drive is 5-1. In this range the tension will vary from approximately plus or minus four per cent at maximum tension, to plus or minus 20 per cent at minimum tension.

★ ★ ★

AS was pointed out before, to say that tension is proportional to current assumes the theoretical case of the entire motor power going into tension with no friction load to overcome and with constant motor efficiency. If it is desired to hold extremely light tension and these components become an influencing factor restricting the range of tension adjustment as well as introducing considerable error in the value of tension between full and empty reel, this constant current can be modified to compensate for this constant torque load. Since this load in horsepower is nearly proportional to reel speed, the current held can be increased by an amount also proportional to speed. By doing this the tension range can be increased over the 5-1 range discussed above.

★ ★ ★

THIS condition is best described by examining horsepower speed curves. These are shown in Fig. 11. There is a definite minimum value of horsepower that can be held, depending upon the magnitude of the constant torque load in the drive. Otherwise the first layers on the reel would be wound with little or no tension in the wire. If, however, the horsepower being held is tapered so that its slope matches that of the friction and windage curve as shown in the bottom half of Fig. 11, then light tension and a wide range of tension are possible. As shown in the top half of Fig. 11, when the horsepower is not tapered, the maximum range of tension that can be held, X to Y, provides a variable error in tension. It is theoretically possible to eliminate any error in tension when the horsepower is compensated for the constant torque load.

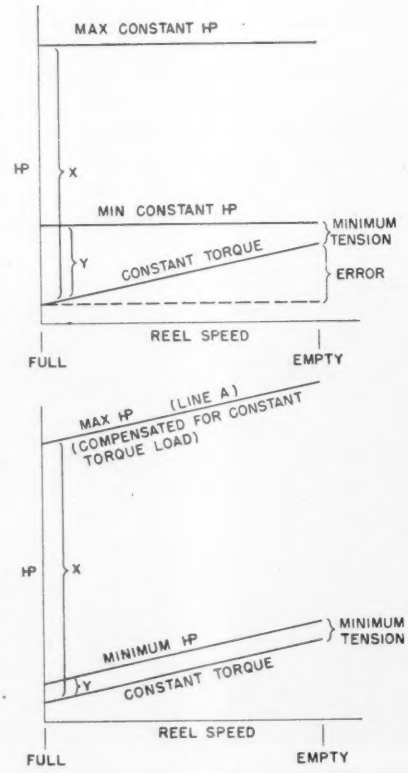

Fig. 11—Horsepower Speed Curves for Reeling.

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Mechanical Signal Systems

FOR applications where wider tension ranges and smaller tensions than can be accommodated by the systems previously discussed, mechanical signal means, such as dancer rolls, rider rolls, auxiliary capstans, etc., must often be used with the electric drives. Often these mechanical devices are considered a nuisance, but cannot practically be avoided.

★ ★ ★

Dancer Rolls

OUTSIDE of the fact that dancer rolls are a mechanical "nuisance", they offer the best solution to the majority of reeling problems. Fig. 12 shows a typical dancer roll scheme. With this system, the most accurate tension control can be obtained because it is a positive method of measuring tension. The tension is put on the wire by having the wire support a weighted roll which rides on the loop of the wire. Thus, the tension in the wire is a function of the weight of the roll and the angle which the wire makes in supporting the weight. As long as the wire supports the weight the tension remains at the desired value.

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THE control for this system is that of a position regulator rather than a horsepower regulator. The control operates to keep the dancer roll positioned between two preset limits and is relatively simple. In this particular system, movement in the dancer roll is reflected in the reactance in the solenoid and this, in turn, controls armature voltage to adjust the reel speed as required.

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IN drives of this sort, overtravel in dancer movement would be provided in each direction to provide for forcing. When the dancer

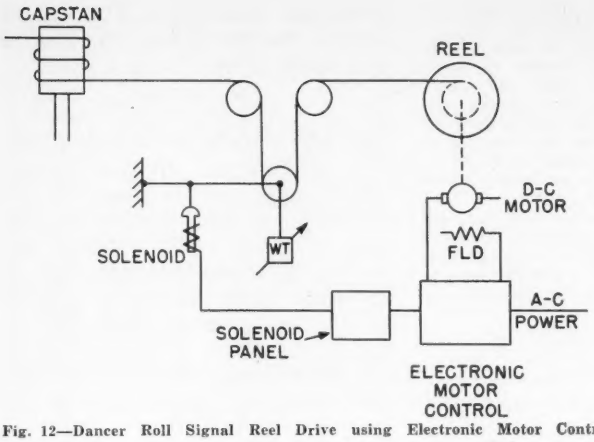

Fig. 12—Dancer Roll Signal Reel Drive using Electronic Motor Control.

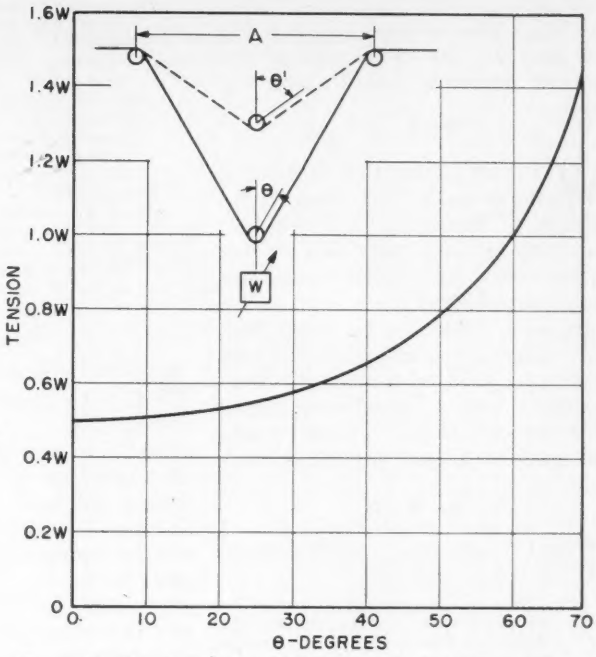

Fig. 13—Tension change effected by Different Angles of Contact Between the Wire and Dancer Rolls.

is in the maximum storage positions the reel speed would be slightly higher than normal empty reel speed. When in the minimum storage position, the control would call for less than normal full reel speed or perhaps even zero speed. Thus as the diameter of the reel increases the "Neutral" positions of the dancer roll changes. By "Neutral" position is meant the steady state position of the dancer roll which will produce the proper reel speed corresponding to the diameter of the reel at that instant. If the reel speed is too low, the storage increases moving the dancer off its neutral which calls for more speed. As the motor speed increases, it momentarily overspeeds until the excess storage is used up and the dancer is returned to its neutral position corresponding to that particular reel diameter. If the reel speed is too high the opposite effect will be obtained. Thus characteristic of the dancer roll neutral position changing with roll diameter, offers an opportunity to "do tricks" with the tension. By properly designing the dancer roll mechanism to utilize different angles of contact between the wire and the dancer roll, the tension can be changed as the dancer roll moves. Fig. 13 shows the tension change affected by different angles of contact between the wire and the dancer roll. This figure indicates that as the neutral position changes as the reel builds up, the angle θ increases which, by referring to the graph, would tend to increase the tension. Thus, if substantially constant tension is desired, the distance A between idler rolls should be kept as small as possible, thereby, keeping θ small. On the other hand, if it is desired to decrease the tension as the reel builds up, this can also be accomplished by proper design of the dancer roll mechanism.

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FIG. 14 shows a reel drive installation that utilizes a dancer

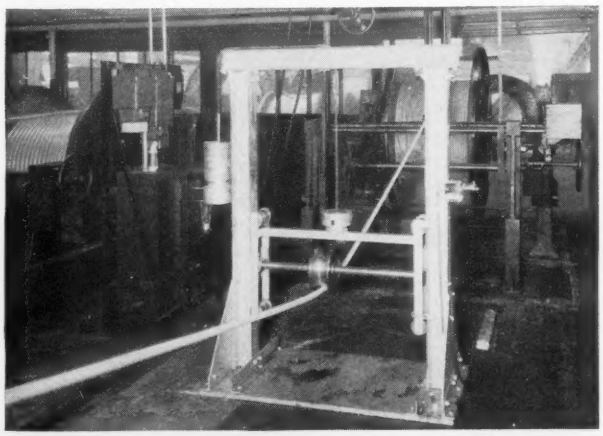

Fig. 14—Reel Drive for Cable Making Machine using Electronic Motor Control and Dancer Roll Scheme

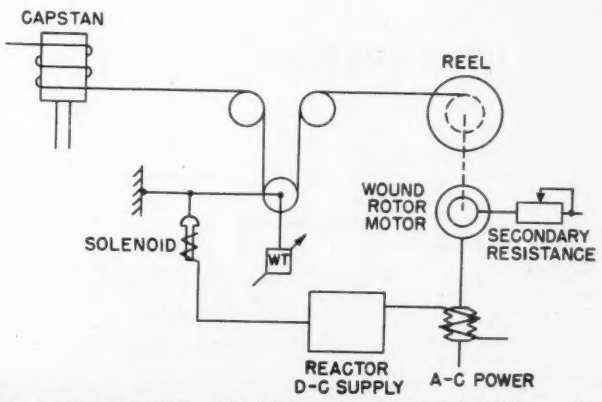

Fig. 15—Dancer Roll Signal Reel Drive using Wound Rotor Motor

roll scheme with electronic motor control. The control solenoid can be seen on the right side of the dancer assembly about half way up.

★ ★ ★

WITH systems that utilize a fixed field, the wire speed variation multiplied by the reel build-up should not be greater than 20-1. For wider speed requirements, both the motor armature and field can be controlled. For such systems, the solenoid would be used to control the field strength and a tachometer signal proportional to wire speed would be used to adjust armature voltage.

★ ★ ★

THERE are many modifications of these schemes:

(1) The motor armature could be supplied by a d-c source and the field controlled electronically through this solenoid scheme.

(2) A simple speed control potentiometer can be substituted for this solenoid. The cost of such a substitution would make a more economical unit, but the chief disadvantage is the shorter mechanical life of the potentiometer. The cost of such devices is so minor, however, that some users do not object to replacing them regularly.

(3) A d-c shunt motor can be used and the field rheostat operated directly from this dancer. This can be used only when the weight is large enough to operate the field rheostat.

★ ★ ★

A SIMILAR scheme is shown in Fig. 15 utilizing a wound rotor motor. Here the solenoid is used directly in the phase shift circuit of a rectifier to control the saturating current of the saturable reactor. In this way, the torque of the motor is adjusted to control its speed. This system has the advantage that large motors can be accommodated, but the disadvantage that little forcing power is available. The speed torque curves shown in Fig. 5 also apply here.

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THESE dancer roll schemes provide storage in the circuit which often can be used to advantage. If the storage in the loop is made great enough, the danger of wire breakage due to improper speed matching (particularly during acceleration and deceleration) can be eliminated. Also, with the proper amount of storage, hunting problems can be overcome more easily.

★ ★ ★

Rider Rolls

RIDER rolls are rolls which ride on the surface of the reel and by means of an arm operate a control device. They are generally a nuisance and should be avoided for wire winding if possible.

★ ★ ★

Application Type 2

APPLICATION Type 2 covers those drives in which the reel sets the speed of the drive and the tension is determined by the friction-drag of the system. A typical example of this type of drive would be a processing line such as tinning or galvanizing where the reel drive supplies the power to pull the wire through the process. Thus the tension in the wire is determined by the friction drag on the wire in the process or by unwinding tension on the unwind reel.

★ ★ ★

A DRIVE for such a system is shown in Fig. 16. In order to wind wire at a constant wire speed, a signal of that speed must be obtained. This can be done in the majority of cases by having a pair of pinch rolls or a capstan driven by the wire and in turn driving a tachometer generator. With this arrangement, the tachometer signal can be matched against a reference voltage in an electronic motor control panel, and the motor voltage adjusted to maintain constant wire speed during build-up of the reel.

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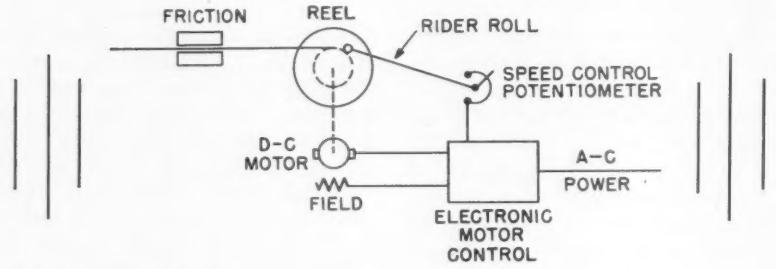

Fig. 17—Motor Operated Potentiometer Scheme for Application Type 2 * * * * *

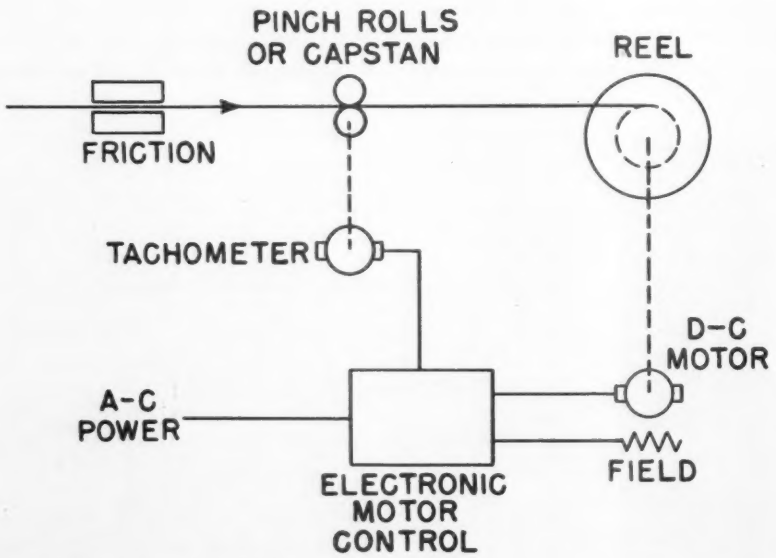

Fig. 16—Electronic Motor Control Drive for Application Type 2 * * * * * *

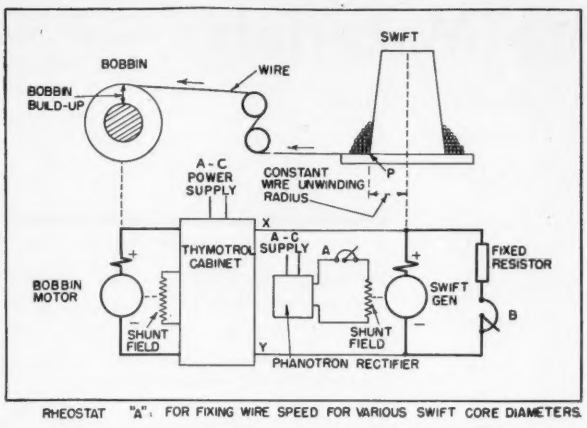

Fig. 18—Electronic Motor Control Rewinding Equipment. * * *

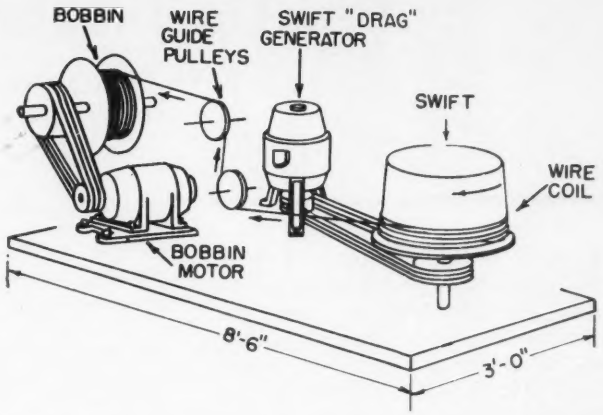

Fig. 19—Arrangement of Typical Electronic Motor Control Wire Rewinding Equipment. * * * * * * * * *

ANOTHER method of doing the same job, which does not do as satisfactory a job, is shown in Fig. 17. This system uses a rider roll on the reel to operate an electronic motor control speed control potentiometer. This method does not hold absolutely constant wire speed. (See page 326)

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Application Type 3

THE basic system included in Application Type 3 is winding wire from a coil on a swift to a reel. Actually this is the same as application Type 2, except that the tension in the system is set chiefly by swift loading.

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FIG. 18 shows a typical system. Here the same fundamental system is used as the first example in application Type 2, except the tachometer signal is obtained from a generator coupled to the swift. Fig. 19 shows the physical arrangement of the equipment. Since the basic design of the swift is such that each strand of wire comes off the swift at the same diameter, this generator voltage is approximately proportional (for a particular field strength) to wire speed, and consequently takes the place of the tachometer generator and pinch rolls previously used. The drag generator serves the dual purpose of adjusting tension because it can be loaded as desired to do so.

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Application Type 4

THIS type covers the unwinding drives where the wire is pulled off the reel by a separate machine capstan. The function of this drive is to fix the tension on the wire paid off. It can readily be seen that for a fixed wire speed, the pay-off reel speed will vary as it pays off, increasing in speed as the diameter decreases. Likewise, it can be seen that, in order to hold constant tension in spite of the changing reel diameter, the torque drag must vary directly with the decreasing radius arm. Fig. 20 shows a regenerative system for holding tension in the wire as it is pulled off the reel. The motor pumps back into the

(*Please turn to page 363*)

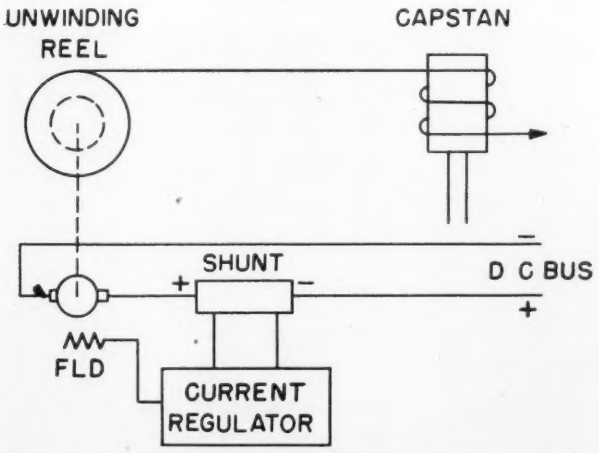

Fig. 20—Current Regulator Drive for Unwinding Reel. * * *

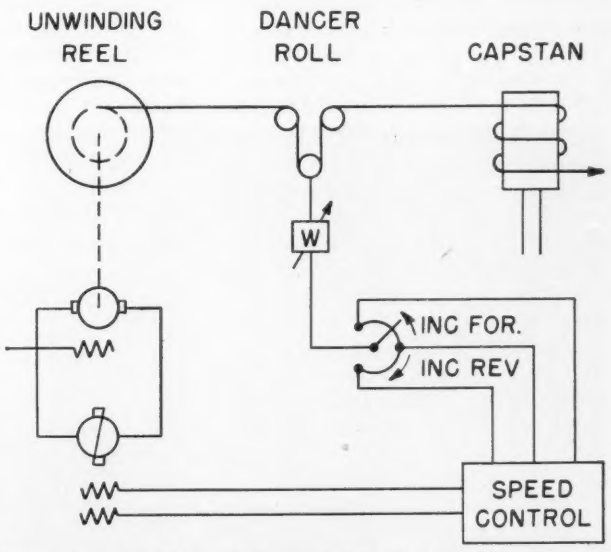

Fig. 21—Unwinding Drive with Dancer Roll Position Control. * *

Plastic Insulating Materials

By E. W. Goral, Materials Engineering Dept.
Stromberg Carlson Company
Rochester, New York.

LONG before World War II it had become evident that a new field for electrical insulation was rapidly being developed. Inasmuch as considerable is known about that field, this article will be limited to the use of cellulose acetate butyrate and nylon as the primary insulation for conductors in the electrical industry.

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Part I

DURING the war new materials were required for electrical insulation in meeting the conditions imposed by new performance standards made necessary by modern warfare. While cellulose acetate has good dielectric properties, this older plastic was known to have definite limitations with respect to flexibility at extremely low temperatures and, as a result, is less desirable for use as wire insulation. However, the mixed esters of acetic and butyric acids are less subject to this limitation and thus offered an excellent opportunity for the development of a desirable type of insulated conductor, cellulose acetate butyrate tape insulated conductors.

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Transition of Insulating Materials

IN 1941 **Stromberg-Carlson Company** had been manufacturing conductors consisting of tinned or enameled copper wires having two silk serves, either one cotton serve or braid, and a wax finish. In humid areas as in the South, enameled wire for switchboards was used in place of the tinned copper wire. In 1943 a series of extensive investigations found that a lacquer finish added greatly to the performance of the wire. Within the next three years steady improvements in wire constructions were achieved as **Stromberg-Carlson** shifted from wax to lacquer finishes, from silk to celanese yarns and

Part I—Development of Cellulose Acetate Butyrate Tape Insulated Conductors.
Transition of Insulating Materials.
Adaptability of Cellulose Acetate Butyrate Tape (CAB).
Difficulties in Tension Adjustments.
Simplified Serving Post.
Superiority of CAB Tape.
Part II—Development of XY Terminal Switch Conductors. (Featuring the solderability of Nylon Insulated Conductors.)

subsequently to cellulose acetate butyrate tape base insulation.

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Adaptability of Cellulose Acetate Butyrate Tape (CAB)

SINCE insulating materials for telephone switchboard, radio hook-up, and communication wires were primarily silk and celanese yarns during the war, investigations on the development of CAB insulation was considered with the point of view of adopting this material to similar serving machinery as additional machines were difficult to obtain. With the cooperation of **The Dobeckmun Company,** who are the slitters for the CAB material manufactured by the **Tennessee Eastman Corporation,** extensive tests were conducted in developing a conductor possessing greatly improved electrical properties at lower cost.

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CONSIDERABLE time was spent in making test runs on

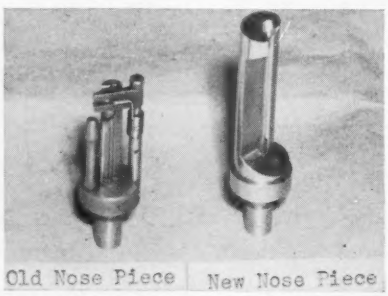

Fig. A. * * * * *

different thicknesses and widths of tape, number of serves, and in arriving at a satisfactory size package. Initial tests on wire insulated with two serves .0015" thick tape were sufficiently gratifying. However, mechanical difficulties were encountered since this thickness did not have the desired tensile strength for the method of application although flexibility was satisfactory. Since difficulties in serving .003" thick tape was not alleviated because the tape was somewhat more brittle than the .0015" thickness, a "happy medium" or .002" ± 10% thick tape was tested and found to have greatly improved mechanical and electrical characteristics.

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Difficulties in Tension Adjustments

IN applying the thin CAB Tape insulation to wire at a flyer speed of approximately 2875 revolutions per minute, the greatest difficulty encountered was due to changing cop tension as the full cop of insulating material was wound down. Packaging specifications were, therefore, constantly changed in an effort to determine the optimum size package which would serve satisfactorily. With a tension adjustment for proper serving of a full cop of tape wound on a tube 1⅛" I.D., 2½" long with 2" traverse, 13 wind for slow take-off, and 4" overall diameter of package, excessive breakage resulted due to increasing cop tension as the cop was wound down to a smaller diameter. The second type of package requested had an I.D. of 1⅝" to shorten the take-off length, thus reducing the tension, but in this case an excessive number of splices in the tape itself were unavoidable during packaging. Consequently breakage was not reduced to a minimum. In the meantime the supplier had perfected improved slitting tech-

niques and assurance was received that minimum of splices could be obtained if it were possible to use a smaller overall diameter of package. Subsequently a change was made to the present specifications of .002″ ± 10% thick CAB Tape, 5/32″ wide, wound on cops 1⅛″ I.D., 2″ traverse, 13 wind, and length of cop 2¾″. No splices in tape. Overall diameter of wrapped tape not to exceed 2¾″.

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Simplified Serving Post

IN continuing to solve the tension problems involved with this Tape, several revised nose pieces resulted in some improvement. However, more successful were the attempts to place tension at the take-off arms rather than at the cop source. Various designs in take-off arms were mounted on the machines, the most notable of which was a simple spool type aluminum post which enabled a smooth take-off from the cop while applying sufficient tension over a 2½″ radius. Take-off arms or posts originally designed for the machines in serving silk and celanese yarns incorporated hook-type arms, Figure I, which had a tendency to wrinkle the tape before application to the wire and added considerably to the cause for excessive breakages. Figures 2, 3, and 4 show the aluminum posts which were used successfully in production not only for this Tape, but also with marked improvement in serving cotton and celanese materials. Production figures immediately increased from approximately 30,000 feet to approximately 250,000 feet a day.

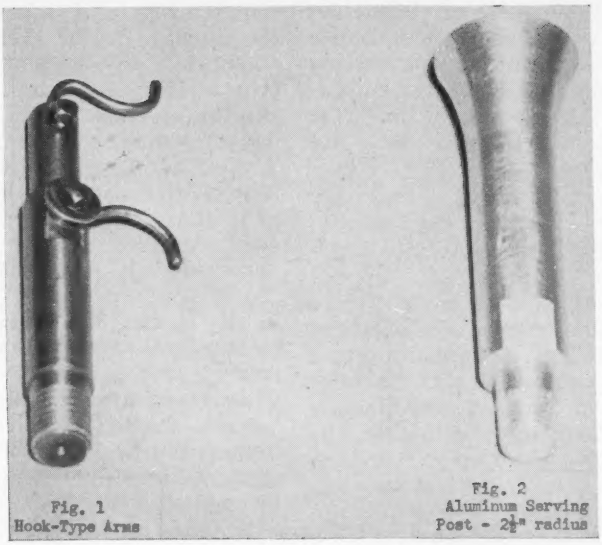

Fig. 1
Hook-Type Arms

Fig. 2
Aluminum Serving Post - 2½" radius

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Superiority of CAB Tape

SUPERIORITY of cellulose acetate butyrate tape insulation on telephone wires over silk, celanese, or extruded plastics is recognized for a number of reasons.

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CELLULOSE acetate butyrate, being a thermoplastic, has no definite melting point but will soften rapidly at temperatures above 350°F. However, recent tests seem to indicate that deformation of wall thicknesses of wire at that temperature results in no loss of dielectric strength. Chemically, the material is stable up to much higher temperatures. This plastic has low moisture absorption. In equilibrium at 20 per cent relative humidity it takes up only 0.4 per cent of its weight in moisture while at 95 per cent relative humidity it takes up 1.7 per cent. This characteristic and the plastic's chemical stability makes the material suitable not only for primary insulation, but for use as a cable lacquer. To this end considerable cooperation was rendered by **The Kauth-Hardy Company** in developing a suitable flame retarding flexible finish which at the present time will meet Underwriters' Flame Test.

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WHERE space is a factor, as it is in so many cases, a plastic that is applied as a tape with 50-60 per cent overlap is the surest way of obtaining safety, that is, concentricity with the use of a

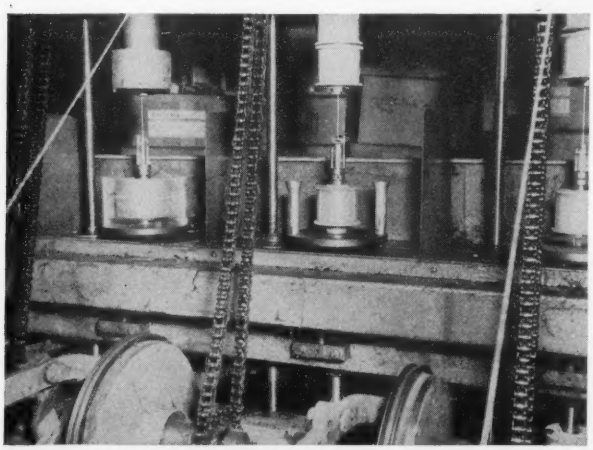

Fig. 3—Cotton and CAB tape serving * * * * * *

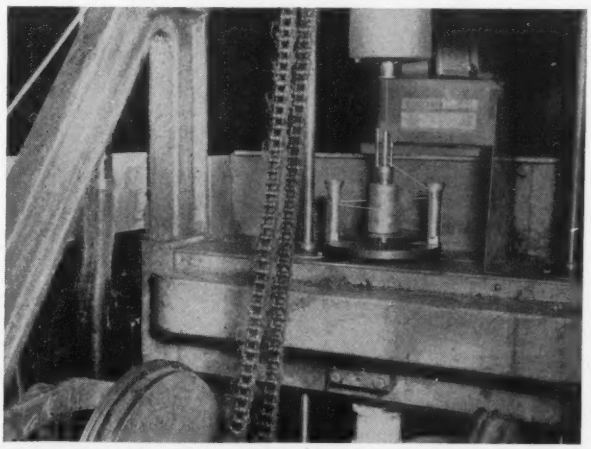

Fig. 4—Cotton Serving * * * * * * * * *

minimum amount of insulating material. The effect is a double serve of tape during one serving application and tests have indicated that tape walls of half the thickness of extruded walls are satisfactory.

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WHEN Cellulose Acetate Butyrate Lacquer is applied through applicators as in Figure 5 over tinned copper wire insulated with CAB Tape and either a cotton serve or cotton braid for color coding and abrasion resistance, a sufficient quantity saturates the outer cotton covering and in combination with the heat of the drying towers, effectively seals the underlying tape insulation into a tube making it "center-sealed", that is, it has a uniform amount of insulation around the conductor. This characteristic also allows the surrounding insulation to handle easier during the stripping operation. For radio hook-up wire, production of stripped lengths was increased tremendously on CAB Tape and cotton braided insulation as compared to celanese and cotton braid requiring the slow operation of "burning off" the insulation.

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THIS development of CAB Tape insulated telephone switchboard and radio hook-up type wires had undergone extensive tests in the Physical Testing Laboratory for several years. Data had been carefully considered in every respect and correlated with requirements and conditions for the humid South. Test results show that the present style of construction is an immediate, if not the best answer, to the problem of humidity, cables, and etc. While CAB Tape insulated tinned copper wire does not have quite as high an insulation resistance as good enameled wire, it has been observed that enameled wire is not always dependable. Pin holes in the enamel film cause low insulation resistance in spots and enamel is most likely to crack when drawn around nails or sharp corners. CAB Tape gives a continuous film which results in uniform electrical characteristics throughout an entire length of wire and has no evidence of cracking when drawn over sharp corners. When subjected to aging tests over small mandrels, it showed excellent electrical and physical characteristics. In meeting the Bureau of Ships Specifications 15-C-1 which was written to cover enamel wire for telephone switchboard use on shipboard, this one type of construction can be used in humid as well as normal conditions for telephone switchboard wire. Although this wire is not as high in all characteristics as enameled wire, it approached those characteristics very closely and with more uniformity. Since enamel wire is difficult to strip and nicking the wire during this operation may cause considerable breakage, the use of CAB Tape insulated tinned copper wire eliminated these difficulties and was a direct cause for the considerable saving in installation time for switchboards. By virtue of eliminating enamel wire, the inventory was also greatly reduced since it was necessary only to stock one type of conductor in the various colors.

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LAST, but not least, there is a cost saving in using this Tape in place of celanese insulating yarns for switchboard wire, and even more so for radio hook-up type wire.

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THIS new plastic insulation pioneered for peace has proved itself in peacetime production of telephone switchboards and radios, and when production of television and other electronic equipment requires it, it is expected that the outstanding properties of this material will insure its continued use as wire insulation.

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DATA on the physical and electrical properties of Kodapak II (cellulose acetate butyrate) are tabulated in Table I. (See page 332)

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DATA on three types of switchboard wires tested per Bureau of Ships Specification 15-C-1 for comparison of the electrical characteristics are tabulated in the following paragraphs. Reference Physical Testing Laboratory Report #1578 dated 12-11-46.

Type I #22 enameled copper wire, one celanese serve, one cotton serve, and lacquered.

Type II #22 tinned copper wire, two celanese serves, one cotton serve, and lacquered.

Type III #22 tinned copper wire, one CAB Tape serve, one cotton serve, and lacquered.

★ ★ ★

Insulation Resistance and Mutual Capacity

THIS specification requires that insulation resistance of a 50 ft. twisted pair shall not be less than 1,000 megohms and that the mutual capacity shall not be greater than 2,500 microfarads at 1000 cps after exposure to 90% relative humidity six samples, fifty feet

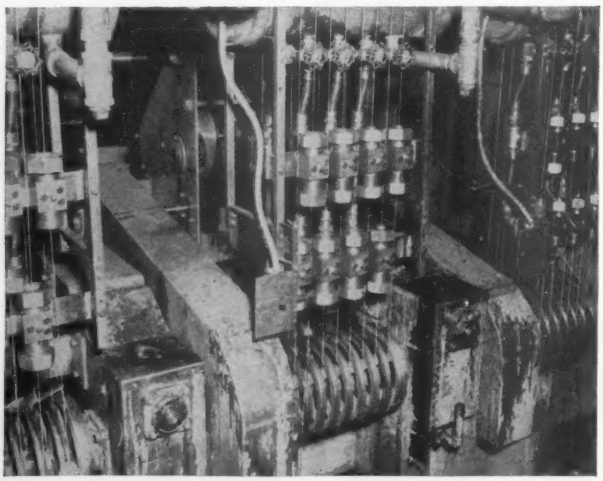

Fig. 5—Lacquer Applicators, Feed Tank and Driving Equipment ★ ★ ★ ★ ★ ★

Harold L. Trembicki, Manager of the Metal Coating Division, Magnus Chemical Co., Inc., is an authority on the subject of new coatings for wire drawing.

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MAGNUS *Metal Coating Division*

CHEMICAL COMPANY GARWOOD, N. J.

IN CANADA—MAGNUS CHEMICALS, LTD., 4040 RUE MASSON, MONTREAL 24, QUE.

TABLE I

Physical		
Tensile strength, 5/32″ x 0.002± 10% Length 10″		2.25 lbs.
Elongation, Length	Not less than	30%
Specific Gravity		1.20
Oven shrinkage, 130°F., 1 week		0.50%
Moisture absorption,		
20% r.h.		0.40 % by weight
40% r.h.		0.55 % by weight
60% r.h.		0.90 % by weight
80% r.h.		1.40 % by weight
95% r.h.		1.7 % by weight
Electrical		
Voltage breakdown, short time		
—50°F		4300 v/mil
0°F		4000 "
70°F		3500 "
212°F		3000 "
270°F		2000 "
After soaking in water,		
70°F		3400 "
Dielectric constant, 1000 cycles		2.5 approx. may be higher
Power factor, 1000 cycles		1.1 %

long of each type, were measured for mutual capacity and insulation resistance between conductors, and the ends sealed with wax prior to placing in the humidity chamber. The samples were measured again after 24, 48, and 72 hours. The mutual capacity was measured at 60 cps because this was the frequency of the bridge available. Each 24 hour humidity cycle was as follows:

2 hours increasing to 60°C at an average of 75% relative humidity.
8 hours at 60°C ± 2°C.
2 hours reducing to 25°C at an average of 75% relative humidity.
12 hours at 25°C and 90 - 95% relative humidity.

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THE measurements were made during the 12 hour period of 90-95% relative humidity as soon as possible after removal from the humidity chamber, and the results tabulated in Table II. The apparent increase in insulation resistance after 48 hours as compared to 24 hours of humidity is due to changes in humidity over the 12-hour period of constant humidity and possible variations in time required to measure samples. The insulation resistance samples change rapidly as they dry out. It should be noted that Types I and III were well above the requirements.

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Dielectric Strength

DIELECTRIC strength measurements were made on the three types of wire and after a 24 hour humidity cycle. The 60 cps voltage was applied at the rate of 500 volts per second to both five foot twisted pairs and to samples prepared by winding five tight turns of the wires around a mandrel of #14 wire. The diameter of this mandrel is approximately the same as the outside diameter of the wire samples. The breakdown voltage on these tests were recorded in Table III as the measure of the dielectric strength of the wires. It should not be concluded that the humidity cycle increased the dielectric strength of the enamel and CAB Tape insulated wires. The random variation in breakdown voltage was large enough to mask any change due to humidity since the same samples could not be used for both tests. We can conclude, however, that the variation is not very great. It should be noted that the breakdown voltage between the mandrel and the wire samples in the case of the enamel wire is much less than for CAB Tape insulated wire. This may be due to cracking of the enamel when wound around the mandrel.

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THE diameters of the conductors were measured and the diameter of the conductor itself. Table IV is a tabulation of these. Averages are for a series of 10 measurements at different places along the wires. All measurements are in inches.

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Part II

WHEN **Stromberg - Carlson Company** purchased the patent rights of the XY Dial Systems

TABLE II

INSULATION RESISTANCE AND MUTUAL CAPACITY BETWEEN FIFTY FT. TWISTED PAIRS

Type of Insulation	Hours of Humidity	Insulation Resistance Megohms			Mutual Capacity Micro-Microfarads			Power Factor %		
		Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.
Type I, #22 A.W.G.	Initial	99,000	100,000	95,000	780	807	760	12.8	13.0	12.0
Enamel, one serve	24	50,000	60,000	32,000	1860	2,010	1,640	23.3	26.0	22.5
celanese, one cotton	48	40,000	60,000	32,000	1830	1,902	1,640	23.0	24.5	19.0
serve lacquered.	72	35,000	50,000	18,000	1760	1,870	1,620	17.5	19.5	15.0
Type II, #22 A.W.G.	Initial	30,000	45,000	20,000	640	660	609	8.25	8.7	7.5
tinned cop., two serves	24	29	33	23	1,150	1,290	1,100	14.6	17.5	12.6
celanese, one serve	48	45	57	40	1,260	1,320	1,220	14.8	15.9	13.5
cotton, lacquered.	72	66	105	45	1,300	1,370	1,140	11.2	12.5	10.5
Type III, #22 A.W.G. tinned cop., one serve	Initial	All samples were greater one million megohms			810	832	770	13.6	14.6	13.0
CAB Tape, one cotton	24	6,000	12,000	2,000	1,720	1,830	1,500	17.1	21.0	14.0
serve, lacquered.	48	7,800	9,600	6,400	1,610	1,710	1,490	14.1	15.4	12.0
	72	5,500	7,000	3,200	1,890	1,980	1,760	18.7	21.0	14.9

TABLE III

BREAKDOWN VOLTAGE BETWEEN FIVE FT. TWISTED PAIRS KILOVOLTS R.M.S. 60 CPS.

Type of Insulation on Conductor	Initial Measurements			Measurements after a 24 hr. humidity cycle		
	Ave.	Max.	Min.	Ave.	Max.	Min.
Type I	5.43	11.0	4.3	5.62	6.2	4.9
Type II	3.03	3.2	2.6	2.59	2.9	2.3
Type III	5.72	6.1	5.2	5.82	6.9	5.3

BREAKDOWN VOLTAGE BETWEEN CONDUCTOR AND MANDREL (.064" Dia.) Kilovolts R.M.S. 60 CPS.

Type of Insulation	Measurements made on wire as received without any humidity cycles		
Type I	2.4	2.9	2.1
Type II	1.6	2.0	1.3
Type III	3.9	4.4	2.5

ELONGATION

There was no visible cracking of the surface on any of the wire types tested after subjection to elongation of one inch in 10 inches, when examined under a three power reading glass.

RESULTS OF ABRASION RESISTANCE TESTS

Average number revolutions of 000 sandpaper on 6 inch drum.

Type I	(Enamel, celanese, cotton, lacquered)	4.5
Type II	(Tinned, celanese, cotton, lacquered)	4.5
Type III	(Tinned, CAB Tape, Cotton, Lacquered)	6

from the Ericsson Company of Sweden, one of the many problems acquired was the production of small diameter conductors for the XY Terminal Cable. Since the outside diameter of this cable could not be exceeded, it was necessary that the outside diameters of the thirty-three individual conductors making up the cable did not exceed .035 inches. The individual conductor consisted of 7 strands of #35 annealed copper wires twisted, insulated with two layers of 60-75 denier natural Tussah silk, waxed, and braided closely with 12 carriers of 60-75 denier 2 end natural China silk, color as specified.

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DURING the latter part of World War II when this development was initiated, it was practically impossible to obtain silk of any denier size. At that time the outrageous price of $25.00 per pound of insulation encouraged a search for different insulating materials.

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UPON request a number of companies had submitted samples of a polyvinyl plastic insulated conductors of approximately 6 mil wall thickness and these at first appeared to be the answer to the whole problem. However, after careful consideration, several disadvantages were observed. Firstly, concentricity of the extruded plastics could not be assured because of the thin wall thickness. At different points along the conductor the base conductor might have less than 60% of required wall thickness. Secondly, the extruded plastic insulation was not available in distinctive multiple color combinations, and thirdly, the insulation had a tendency to creep and flow back during soldering.

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EXPERIMENTAL development of conductors more nearly duplicating the Ericsson type construction was initiated with nylon, celanese, and rayon insulating materials early in 1946. Numerous runs were made with different number of ends of material in an attempt to acquire suitable physical and electrical characteristics. It was found that two serves of #20 denier nylon insulation, 10 and 11 ends, left and right hand lay respectively, applied to the base conductor met the requirements adequately. The outer braided covering, however, presented still another problem. Since a 12 carrier braiding machine was not available, it was necessary to determine the size of braiding twine that could be used on an 8 carrier braider without exceeding the overall finished conductor size of 0.035 inches. With the cooperation of the **Sauquoit Silk Company**, this phase of construction was solved by using 100 denier 2 end nylon. Considerable work extending over a six month's period was done by the **Sauquoit Silk Company** and the **E. I. DuPont de Nemours Company** in making the dyed material fast to light. At the request of the suppliers, it was necessary to change the twine from 100 denier 2 ends to 200 denier 1 end nylon as considerable winding difficulties after dying were encountered with the former twine.

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THE nylon braiding was done on braider's having small tanks located underneath so that **Kauth-Hardy's** L-231 Sealer could be applied to the nylon served wire prior to and during the braiding operation. This procedure seals the two serves of nylon and nylon

TABLE IV

Wire Type	O.D. Ave.	O.D. Max.	O.D. Min.	Average Wall Thickness
Type I, #22 A.W.G. Enamel, one celanese serve, one cotton serve, lacquered.	.0443	.0435	.0450	.0092
Type II, #22 A.W.G. Tin, Cop., two celanese serves, one cotton serve, lacquered.	.0474	.0465	.0480	.0110
Type III, #22 A.W.G. Tin, Cop., one CAB Tape serve, one cotton serve, lacquered.	.0496	.0503	.0490	.0061 over tape .0122 overall

braid and prevented fraying. It also eliminated the waxing step as specified in the Ericsson type of construction which had a tendency to darken the multiple color coded conductors to a large extent. Advantages of this construction over the plastic insulation are as follows:

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CONCENTRICITY was assured in all lengths of wire as two serves of nylon in opposite directions resulted in uniformity.

★ ★ ★

COLORS were distinctive and easily distinguishable in multiple color combinations. Color scheme could readily be changed when necessary.

★ ★ ★

SOLDERABILITY was the most outstanding feature not only over the plastic, but also over the silk insulation. This feature was observed while attempting to solder the insulated conductor without removing the insulation. With plastic and more so with silk insulation, stripping was a tedious operation. Not so with nylon as this step was not necessary. All that was required in soldering to the multiple terminal block was a momentary contact with solder and soldering iron and a satisfactory connection was achieved. The nylon insulation did not creep or flow back, but readily dissipated only at the point of soldering without causing any deleterious effect.

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ELECTRICAL characteristics were satisfactory.

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PHYSICAL characteristics were excellent in regard to flexibility, toughness, abrasion resistance, elongation, breaking strength, etc. However, solderability was the outstanding feature since considerable saving in installation time was thus achieved.

★ ★ ★

Acknowledgment is made to the following organizations for cooperation rendered in the development of this conductor:

The Sauquoit Silk Company.
E. I. DuPont de Nemours Co.
The Kauth-Hardy Co.

★ ★ ★

Acknowledgment is made to the following organizations for their cooperation in the development of Cellulose Acetate Butyrate Tape Insulated Conductors as produced at Stromberg-Carlson Company:

The Dobeckmun Company.
The Tennessee Eastman Corporation.
The Kauth-Hardy Company.
The Roxalin Flexible Finishes Co.
The American Insulating Machinery Co.

WIRE ASSOCIATION PROGRAM COMMITTEE FOR 1949 CONVENTION

Mr. Fred M. Crapo, President, Indiana Steel & Wire Co., Muncie, Ind., General Chairman of the Program Committee for the 1949 Annual Convention of the Wire Association, which will be held at the La Salle Hotel, Chicago, October 17-21, 1949, announces the completion of the Program Committee and lists the following appointments.

★ ★ ★

PROGRAM COMMITTEE
WIRE ASSOCIATION CONVENTION
La Salle Hotel, Chicago, Ill., Oct. 17-21, 1949
Fred M. Crapo, President
Indiana Steel & Wire Co., Muncie, Ind.
GENERAL CHAIRMAN

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C. H. Hannon, Metallurgist,
Pittsfield Works Laboratory,
General Electric Company,
Pittsfield, Mass.

Dr. F. R. Morral, Associate Professor,
Department of Materials Engineering,
Syracuse University
Syracuse 10, New York

Matthew J. Donachie, Metallurgist,
The Beryllium Corporation,
Reading, Penna.

J. K. Findlay, Metallurgist,
Allegheny-Ludlum Steel Corp.,
Dunkirk, New York

★ ★ ★

GENERAL ACTIVITIES

SMOKER-DINNER

Eber J. Hubbard, Jr., Vice President
Hubbard Spool Company
Chicago, Ill.

Richard E. Brown
Executive Secretary

THE WIRE ASSOCIATION
300 Main St., Stamford, Conn.

RESERVATIONS AND REGISTRATION

Mrs. Ruth S. Spengel, Secretary and Treasurer
WIRE AND WIRE PRODUCTS
300 Main St., Stamford, Conn.

The committee has started work to secure papers for the meeting and reports very satisfactory progress. Association members are invited to submit papers for consideration to the chairman of the respective divisions. All papers must be in the hands of the committee by July 1—and those selected will be preprinted in Wire and Wire Products October 1949 issue in advance of the meeting. Title to papers accepted will be given the Wire Assocciation and duly copyrighted at time of publication. All papers are eligible for consideration for the Annual Medal Award.

You Are Invited to be With Us for the WORCESTER REGIONAL MEETING of the WIRE ASSOCIATION

Place: Sheraton Hotel, Worcester, Mass.

Time: Friday, April 22, 1949, at 6 P.M.

Cost: Registration Fee, including Dinner—$5.00

The program to be presented under the chairmanship of Rodman R. Tatnall, Metallurgical Engineer of the Colorado Fuel and Iron Corporation, will include:

Talk: Beryllium Copper by Matthew J. Donachie, Works Manager, Beryllium Corporation of America.

Paper: Historical Background of the Wickwire-Spencer Steel Div., C. F. & I., in which the development of machines and processes in the making of wire and wire products will be traced. Slide illustrations will supplement the talk, that will be presented by John A. Bachman of the Wickwire-Spencer Steel Division.

Motion Picture: "Indian Paint"—showing the manufacture of wire rope from ingot to finished product. Shown through the courtesy of C. F. & I.

Motion Picture: Impregnated Paper Insulated Cables—shown through the courtesy of The Okonite Company.

We want a good turn-out for this meeting. All wire men are cordially invited to attend. If you have not sent your reservation, please advise us immediately of your intention to attend and how many will be in your party.

THE WIRE ASSOCIATION

RICHARD E. BROWN, EXECUTIVE SECRETARY

300 MAIN STREET

STAMFORD CONNECTICUT

Aluminum Wire

Part II

WELDING FOR WIREDRAWING

by

J. HUTCHINSON, ESQ.
Development Engineer, Sciaky Electric Welding Machines, Limited.

The second of four lectures on aluminum wire given before the Staff School of Frederick Smith & Co., Ltd., at the Caledonia Works, Halifax, England.

Introduction

IN considering Butt Welding Light Alloy Rod for wiredrawing, it is perhaps desirable to review the principles of Resistance Welding in general with particular note to Spot Welding of Light Alloys, which process has been general practice for a large number of years.

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THE technique of the two processes is similar in as much that the three main variable factors governing **Butt Welding** of Light Alloys are the same as for **Spot Welding** of Light Alloys but in considering the Butt Welding process we find that there are less "subsidiary" or operational variables to contend with than in the Spot Welding process, therefore we may suggest the Butt Welding process is an easier proposition from the production point of view.

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Resistance Welding — General Principles

AS a method of joining two or more components, resistance Welding owes its existence, and its success, to the following combination of facts:-

(a) The heat is produced by passing an electric current through a Resistance.
(b) That for a given current density —the greater the resistance to its flow, the more heat is produced.
(c) That a large amount of energy can be quickly applied to a small area and can be easily controlled.
(d) That the heat can be limited to the area required to be heated.
(e) That pressures can be applied during welding and so squeeze out scale and oxide from the weld face.
(f) That alternating current, which is necessary for the easy transformation of line voltages to the low voltages required for Resistance Welding is widely distributed, and its cost is a small proportion of the value of the product of the weld.

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Resistance Spot Welding

RESISTANCE welding can be likened to the Blacksmith weld, but its advantages over the Blacksmith method are many. The main advantage lies in the fact that welding heat is generated on the weld faces while the two metals are in intimate contact. Another advantage lies in the fact that the process is not confined to Ferrous metals, but can be used in the welding of almost all non-ferrous metals.

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THE spot weld is accomplished by holding together the parts to be welded under mechanical pressure between two electrodes, through which a heavy current is passed for a pre-set period.

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OWING to the fact that the interface of the two component metals must constitute the highest point of Resistance in the weld circuit, it is at this point that fusion takes place.

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Operational Sequence in Resistance Welding (Spot)

(I) Work is placed between the welding electrodes and mechanical "PRESSURE" is applied, bringing the interfaces of the metal together just at the spot where the weld is required.
(II) The Welding Transformer becomes energized when a pre-set pressure has been reached, and a heavy CURRENT passes across the welding faces.
(III) After a TIMED period, welding current is cut off.
(IV) Electrode pressure is released.

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FROM this sequence of operations it is seen that there are three main variable factors—"current", "pressure" and "time".

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Control of Variables

THE fact must be realized from the beginning that variations in Resistance welding conditions, particularly with respect to current, pressure and time, will have a decided influence on the physical and metallurgical characteristics of the weld, therefore careful consideration must be given to these three variables.

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THE machine to be used for resistance welding must be so designed as to be capable of being pre-set to accurate combinations of these three factors, so that when the machine is correctly set the welding conditions will remain uniform during a production run.

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Relationship of Variable Factors

THESE variables can be compared by considering the simple general Formula:

where $H = I^2 R_1 R_2 t$

H = welding heat
I = current
R_1 = Specific Resistance of weld metal
R_2 = Interfacial Resistance of weld metal
t = Time of current flow.

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THE **Specific Resistance** of the weld metal will be an indication of the amount of current required—that is for a given gauge or cross-section of metal. The lower the specific resistance the **Higher** will be the required current. The higher the specific resistance, the lower will be the required current value.

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THE **Interfacial Resistance** is under the control of the applied mechanical pressure—small subsidiary Factors such as conditions of metal surface would influence this resistance, but the main variable would be the applied mechanical pressure during the time of current flow and this comes under the control of the machine setting.

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FROM this it can be stated that the welding heat is directly proportional to the **current** and **time** and inversely proportional to the applied mechanical **pressure.**

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Subsidiary Variables

APART from the type of welding machine used on the work, a great deal of the success in Spot welding Light Alloys is due to the attention paid to, and the control of, a number of subsidiary variable factors. These can be summarized as follows:-

(a) Specific resistance of weld metal.
(b) Specific resistance of electrode tips.
(c) Electrode tip shape and size.
(d) Correct alignment of electrode tips.
(e) Surface conditions of weld metal.
(f) Thickness of gauge or weld metal.
(g) Spacing of spots.
(h) Edge distance of spots.
(i) Variation in throat dimensions of machine.
(j) Amount of magnetic material in the throat.

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AS these variables relate to **Spot** welding of Light Alloys it is not intended here to consider these in detail. Regulations are laid down for their control. However it is only fair to suggest that consistency in results cannot be obtained if consistency in conditions is not maintained.

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Butt Welding Light Alloys for Wiredrawing

IN comparing Butt Welding of Light Alloys with Spot Welding of Light Alloys, the Butt Welding process has certain advantages over the Spot Welding process in the fact there are less subsidiary variables to contend with.

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CURRENT, pressure and time have to be brought under the same accurate control of the machine, and owing to the low resistivity of the Light Alloys the same High Currents are called for, but factors such as electrode tip size, tip deformation, spacing of spots, edge distance etc. do not come into the process.

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THE relationship between the three factors coming under the control of the machine are the same for Butt Welding as for Spot Welding. We depend upon the current value and the resistance at the welding faces to give the fusion heat. The time factor is also important when considering Light Alloy Butt Welding.

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IN principle the Butt Welding Machine is designed much similar to the Spot Welding Machine, with the exception that platens carrying clamping dies take the place of electrode shanks and electrodes. The work pieces being fixed in the clamps instead of being placed between the electrode tips, also the ram movement in Butt welding is generally horizontal instead of perpendicular as is usually the case in Spot welding.

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THE methods used for pre-setting the current values are the same as for Spot welding tap changing links on the primary of the welding transformer which determine the transformer turns ratio, and where fine intermediate adjustments are needed electronic heat control is used.

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FOR controlling the welding current duration, limit switches actuated directly by the movement of the platen itself have been used for a number of years on the standard type of Butt welding machine. This method has proved very efficient and can be employed on Butt welding machines for Light Alloys with equal success providing they are capable of fine and accurate adjustment.

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IN Butt welding Light Alloys, it is essential that the welding faces of the rods are flat and parallel to each other. The faces are Butted together under an initial pressure before the current is initiated. A high spot or corner would obviously cause the faces to flash owing to the high resistance at that particular point.

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THE weldding faces should be brought to welding heat very quickly after current initiation. The time factor depending upon the cross sectional area of the rod. In the case of ⅜" rod a time of about one second is found suitable for most Specification of Alloy.

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A PUSH-UP pressure normally takes place at the same time as current cut-off, but the relationship between current cut-off and push-up pressure will vary a little according to the rigidity of the metal.

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THE machine used for welding Light Alloys for wiredrawing must be automatic in action and capable of being pre-set to accurate combinations of the essential factors.

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CARE should be taken during the welding process that cer-

tain operational variable factors do not upset the control of the process.

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THE following subsidiary variable factors can and do influence the quality of the resultant weld.

(I) Specification of Light Alloy.
(II) Uniformity of clamping contact.
(III) Cleanliness of clamping contact.
(IV) Variation of clamping pressure.
(V) Freedom in movement of moving platen.
(VI) Distance from weld faces to clamping dies.
(VII) Heat dissipation from weld zone.
(VIII) Alignment of clamping dies.

Control of Subsidiary Factors

SPECIFICATIONS of the rod should be known so that welding conditions can be recorded. This applies particularly to "Specific Resistance" and "Rigidity". The resistivity of the alloy is so low, that a variation in this quality will have a definite influence on the resultant weld. We must remember that the specification of any Light Alloy is one of the controlling factors so far as machine settings are concerned. **Clamping** should always be uniform over the clamping contact area. The function of the clamping dies is twofold (a) to hold the work firmly in correct alignment, with enough pressure to prevent slipping, and (b) to convey current to the weld faces.

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IF the clamping dies are badly designed and/or badly constructed, clamping conditions may vary from weld to weld. This will put the machine setting out of control, also if foreign matter is allowed to settle between the clamping faces and the work this would again put the machine out of control.

Variations in Clamping Pressure

IN considering the amount of pressure applied to the Clamping Dies, we must keep in mind the fact that we are passing a heavy current between the faces of the clamps and the work. These faces constitute an electrical contact. If this clamping pressure is not kept constant, the electrical contact at these faces will not be constant. This variation of electrical contact will, in most cases—depending upon the area of contact—create a variation in the electrical resistance of the welding circuit, and so vary welding conditions.

Heat Dissipation from the Weld Zone During Welding

OWING to the high thermal conductivity of Light Alloys, heat will dissipate very rapidly from the weld faces. A great deal of heat will dissipate into the mess of the Copper Clamping Dies. The area of clamping contact and the **distance between the clamping dies** from the weld faces, will greatly influence the amount and speed of heat dissipation and a variation of clamping distance will vary the heat dissipation.

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TO obtain our weld we must have a concentration of heat across the weld faces, and to bring this about we must replace this heat as fast as it is being dissipated. If we endeavor to obtain this condition by increasing the current value we would probably only succeed in overheating the metal between the clamping dies and the welding faces, owing to the fact that the two component parts are carrying the current from the clamping dies to the weld faces.

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CONSIDERING the fact that the line of contact in our weld zone must be the point of highest Electrical Resistance in the welding circuit, the correct procedure would be to reduce the initial welding pressure to as near the flashing point as desirable.

Alignment of Clamping Dies (Variation of)

MISALIGNMENT of clamping dies will not only cause a bad finish to the job, but will also greatly influence the resultant weld, owing to the fact that the cross sectional area at the welding faces will be reduced.

Freedom in Movement of Moving Platen

THE speed of movement of the moving Platen is a very important factor. The Platen slides or carriers must not offer resistance to this movement during the welding or push-up period.

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THE gentle yielding of the metal at the weld face as it is brought to fusion heat, should control this movement and any slowing up or hold-up of this movement through slide friction would effect the resultant weld, a hold-up would cause a flash if this occurred during the current-on period.

Drawing Test

THE normal Tensometer Tests on a welded specimen may show favourable figures in elongation and ultimate stress. This however is not necessarily an indication that the weld area will draw successfully. A small variation in hardness in the weld zone will probably cause a failure in drawing. This condition can be rectified by post heating the weld zone.

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THIS post heating can be accomplished by fitting an extra pair of clamping dies on the welding machine. After welding, the specimen is moved from the "Welding Dies" to these "Annealing Dies". The annealing dies are **fixed** and spaced usually about 3 to 4 inches, depending upon the gauge of rod. Current to the value of 50 per cent of the welding current is then passed through the length of rod between the dies. This post heating usually rectifies any variation in tensile properties in the weld zone.

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(*Please turn to page* 360)

THE WIRE ASSOCIATION - CANADIAN REGIONAL MEETING

PROGRAM DETAILS

Plans for the Canadian Regional Meeting in Montreal on April 28th and 29th are now finalized and the chairmen of the various subcommittees have been appointed as follows:

HOTEL COMMITTEE (including reservations, registration and banquet, etc.)

Chairman—Dan Boyd—The Northern Electric Company

Members—W. Walker—Phillips Electrical Works

W. W. Haldimand—B. Breening Wire Company

F. Cobbett—Canadian General Electric Company

All these personnel represent the Montreal Office of the various firms.

PAPERS COMMITTEE

Chairman—T. R. Jopling—Canadian Tube & Steel Products

PLANT TRIPS COMMITTEE

Chairman—George Layt—The Steel Company of Canada, Dominion Works

Member—A. E. Wiggins—The Northern Electric Company, Lachine

PUBLICITY AND EXHIBITS COMMITTEE

Chairman—Tom J. Tracey—Canadian General Electric Company, Montreal

The Ladies' activities for the convention are to be limited to the operation of an information bureau at the hotel where information on such matters as shopping facilities, tours, theatres, etc., can be given. The program of the two day Meeting will be as follows:

April 28th

9—10:15 a.m.—
Registration at the Mount Royal Hotel on the mezzanine floor.

10:30 a.m.—
Buses leave the Mount Royal Hotel for the plant visit to the Steel Company of Canada, arriving at 11 a.m. The visitors will leave the Steel Company Works at 1 p.m. and arrive at the Northern Electric Company at 1:15 p.m. where lunch will be provided at 1:30 p.m.

2:30—4:30 p.m.—
Plant visit at the Northern Electric's new non-ferrous mill at Lachine, Quebec. At 4:45 p.m. the buses will return to the Mount Royal Hotel and further activity will commence at

6:30 p.m.—
Cocktail Hour in the Ballroom of the Hotel.

7:30 p.m.—
The Association dinner will commence, ending about 9:45 p.m. when the party will adjourn to the Normandie Roof for dancing and entertainment.

April 29th

10:00 a.m.—
First technical session.

Paper by Charles P. Orr, President of Standard Industrial Compounds, Ltd., Chicago, on the subject of "Dry Drawing" with particular accent on ferreus material.

The second paper of the morning session will be a paper by E. L. H. Bastian, Staff Engineer of the Shell Oil Company, New York City.

2:00 p.m.—
The afternoon session will commence and will consist of the following papers:

"Modern Electrical Control for Wire Mill Machinery" by O. M. Bundy, Ass't Chief Engineer of the Clark Controller Company, Cleveland, Ohio.

"Modern Pyrometric Practice Controls" by J. R. Green of the Minneapolis-Honeywell Regulator Company of Pittsburgh.

The third paper, with a motion picture, will cover the subject of "Material Handling" under the sponsorship of the Baker-Raulang Company. The speaker at that time will be either the General Sales Manager or the Vice-President in charge of sales for the Baker Co.

In connection with the dinner, it should be noted that there will be no cover charge for the entertainment at the Normandie Roof. Persons attending the Association dinner will be given identification tickets for this purpose.

The fee for the registration will be $5.00. This will entitle registrants to transportation, plant visits, luncheon on April 28th and entrance to all technical sessions. The charge for dinner and entertainment on the evening of April 28th will be $5.00 per person.

Interest has been shown by the Montreal Branch of the American Society for Metals and the Engineering Institute of Canada and both these organizations are cooperating with our Committee in publicizing the event.

Registrations are coming in very well and all persons who desire to attend should make sure that they have their registration in as early as possible. The registration fee of $5.00 covers completely the plant trips, luncheon on April 28th and entrance to the technical sessions.

In order that visitors from out-of-town may obtain the maximum advantage from their visit to Montreal, the two day meeting has been arranged on Thursday and Friday in order to allow a full weekend of visiting in the Canadian metropolis. This will be a splendid opportunity for out-of-town members from the United States and Canada to bring their wives to Montreal where shopping facilities, theatres, tours and entertainment are all close at hand to the modern hotel facilities of the Mount Royal.

REMEMBER APRIL 28 and 29 - MONTREAL

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Yes, *every* die you buy from Carboloy has the insurance of quality that only rigorous testing can give it. And you need this Carboloy quality in your dies!

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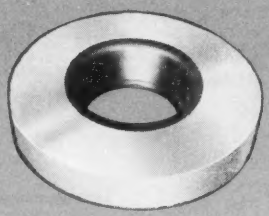

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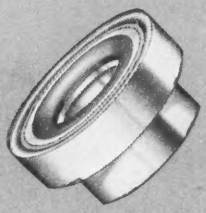
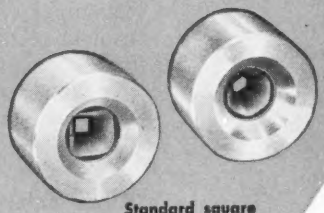
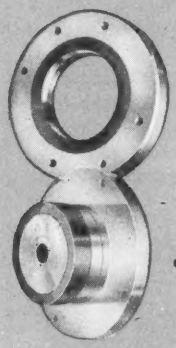


Special round-hole dies



Standard square and hex dies



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J&L Post-War Improvement Program

Some major phases of the post war improvement program undertaken by Jones & Laughlin Corporation, the largest program of the company's 97-year history.

THE post-war plant improvement program of Jones & Laughlin Steel Corporation is the largest in its 97-year history. Every phase of steel production from ore mines through finishing mills is affected by the program which now provides for estimated expenditures totaling more than $210,000,000. The Corporation is spending on improvements and rehabilitation in this post-war program an amount equal to two-thirds of the Corporation's gross plant value at the end of the war.

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MAJOR phases of the program to be undertaken or completed next year follow.

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COMPLETION of the world's largest coal washer at Vestaburg, Pa. Consolidation of Vesta No. 4 and Vesta No. 5 mines into the largest underground coal mine in the world.

★ ★ ★

CONSTRUCTION of a new six-furnace open hearth shop in Pittsburgh, Pa., and the necessary corollary and finishing facilities at Pittsburgh and Aliquippa, Pa. Works.

★ ★ ★

CONSTRUCTION of a new central boiler plant at South Side, Pittsburgh Works, to replace five obsolete plants, is nearing completion. Two of the new boilers are operating and three more will be completed early in 1949.

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THE enlarging of No. 5 blast furnace at Pittsburgh has been started and will be completed in January, 1949. Installation of two additional turbo blowers at the blast furnaces is under way. One is in operation and the other will be in operation early in 1949.

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AN additional Bessemer converter—bringing the total at Pittsburgh to three—is under construction and will be in production by the middle of 1949.

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A PROGRAM to expand and improve the hot and cold strip mill at the Pittsburgh Works, has been started with the rebuilding and improving of slab-heating furnaces. The program includes installation of a new hot coil conveyor system, and additional cold finishing facilities.

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THREE five-hole blocks of soaking pits have been authorized for Pittsburgh Works. One block will be completed during 1949. Sixty 100-ton slab rack cars to handle hot steel are being installed.

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NO. 1 blast furnace at Otis Works will be enlarged and relined during 1949. A new turbo blower will be installed. Hot strip-sheet and cold rolling facilities will be modernized and expanded.

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MAJOR expenditures are under way at the Corporation's ore mines in Minnesota, New York and Michigan.

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PART of the program is already completed and becoming effective. During the past year, the world's fastest rolling mill for cold reducing tin plate coils went into production at Aliquippa Works.

(*Please turn to page* 366)

Extensive improvements in wire producing facilities, such as the new electric annealing unit shown here, have been completed at the Aliquippa (Pa.) Works, Jones & Laughlin Steel Corporation. Installation of more new wire producing equipment is planned during 1949.

GOVERNMENT WIRE PRODUCTION INFORMATION

Government Report on Cold Extrusion of Steel

EXTENSIVE new data on the cold extrusion of steel is now available to the American public in a 138-page report released today by the Office of Technical Services of the Department of Commerce.

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THE new report covers work done for the Army Department by the Heintz Manufacturing Co. of Philadelphia to adopt German-developed technology in this field to American productive processes.

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WHILE the research described relates specifically to several ordnance items, the information will be of use in any field in which the extruding of low-carbon steel will be useful, according to O.T.S. In many cases the cold extrusion of steel is expected to replace extruded and drawn nonferrous products as well as ferrous castings.

★ ★ ★

AN important section of the report deals with the development of efficient automatic "phosphatizing" (bonderizing) techniques, and actual test runs on ordnance items. Phosphatizing, the application to steel of a lubricating finish for cold extrusion, is the key to the success of this process.

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TESTS indicated that cold extrusion could not only substantially reduce the cost and time necessary for the production of many parts, but also could improve their mechanical properties and result in a saving of metal. It is suggested that many items could be redesigned for more efficient production by cold extrusion without impairing their usefulness.

★ ★ ★

THE report is copiously illustrated with photographs and blueprints. PB 96704, **Cold Shaping of Steel—Summary Report,** 138 pages, is available at $17.50 in photostat form, $5.50 in microfilm. Orders should be addressed to the Library of Congress, Photoduplication Service, Publication Board Project, Washington 25, D. C., accompanied by check or money order payable to the Librarian of Congress.

★ ★ ★

New Comprehensive Export Schedule

THE Office of International Trade, U. S. Department of Commerce, announces that the Comprehensive Export Schedule has been redesigned to give the world trader the current export information he needs in easier, handier form.

★ ★ ★

STARTING with Number 27 effective on or about March 1, 1949, the Schedule will be published annually on loose-leaf pages (7-⅞" x 10-¼") punched for use in any standard three ring binder. The Schedule can be easily amended and revised by the in-

MICROMETER PRECISION

MICRO WELD

TRADE MARK REG. U. S. PAT. OFF.

MODEL "J" TYPE AUTOMATIC MICRO-WELD BUTT WELDER

This type welder is available in five Models (J-45-C) (J-5-C) (J-6-C) (J-7-C) (J-8-C) for welding COPPER, ALUMINUM, and other non-ferrous wire and rods, ranging in size from .080" to ½" diameter.

The welding cycle on these units is automatically completed by one single downward stroke of the foot pedal, which clamp the stock being welded, contact the welding switch, and apply the upset pressure on the weld.

All welders are equipped with annealing dies, filing vise, hand shears, and mounted on a 4-wheel truck.

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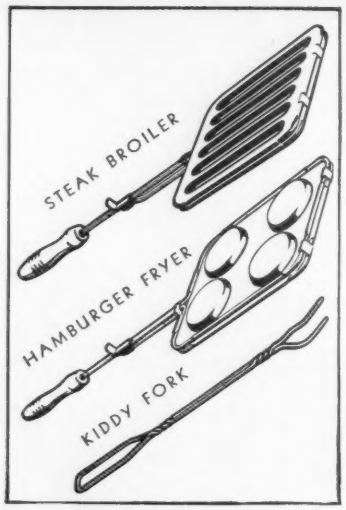

U. S. Picnic Accessories give added enjoyment to the art of campfire cookery.

You'll notice that wire is of prime importance in the construction of these items. For this reason the manufacturer specifies Keystone wire that has an **extra brite finish** for added sales appeal . . . proper ductility to withstand severe twisting operations . . . and the necessary strength to hold its shape under rugged conditions.

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sertion of the weekly Current Export Bulletins issued in the same format.

★ ★ ★

EXPORT regulations appearing in the Federal Register will be published in the new Comprehensive Export Schedule in their entirety. Interpretive or explanatory material, readily distinguishable through the use of different size type, will accompany these regulations. At the end of the Schedule export quotas, facsimile forms, and other material will appear as numbered supplements.

★ ★ ★

THESE regulations, the additional material, and the improved format, are the result of recommendations and suggestions received from the export trade. They will provide the exporter with an up-to-date and complete volume of export control instructions and procedures.

★ ★ ★

THE new Comprehensive Export Schedule, including the weekly supplements and revised table of contents, can be obtained at an annual subscription rate of three dollars ($3.00) to domestic subscribers, and four dollars ($4.00) to foreign subscribers. All subscriptions will date from the Schedule's effective date. Provisions will be made to supply single Current Export Bulletins when required. Fill out the order form on the back of this announcement and send it with remittance to the Superintendent of Documents, Government Printing Office, Washington 25, D. C., or to a Department of Commerce Field Office. Check or money order should be made payable to the Treasurer of the United States.

★ ★ ★

I.D.A. Convention and Exposition

STILL another industry has taken the graphic story of the general public's benefits from a basic product. For the first time, the story of the diamond as it applies to mechanical production was portrayed in the course of an Exhibition and Convention of the Industrial Diamond Association of America.

★ ★ ★

THE Industrial Diamond Association, in the first three years of its existence, devoted all educational effort to the dissemination of its technical articles. These gave expert advice on the use and care of diamond tools, toward a fuller and more economical use of industrial diamonds. I.D.A. has followed other great industries by showing, through exhibits of hundreds of items, the application of diamonds to workpieces, the assemblies of these workpieces, and the many indispensable products made through the use of diamonds.

★ ★ ★

MANY trade associations and manufacturing companies collaborated with the I.D.A. in furnishing items for these graphic displays, and the diamond toolmakers of the Association made their contributions in kind.

★ ★ ★

PUBLIC recognition came to the Industrial Diamond Association in 1948 when it received a 1947 Award of Merit of the American Trade Association Executives. The Jury of Awards was headed by Secretary of Commerce Harriman and included such men as the Presidents or Vice-Presidents of the N.A.M., the U. S. Chamber of Commerce, and the Automobile Manufacturers Assn., who cited I.D.A.: "For having rendered outstanding service to the industry which it represents as well as to the American Public."

★ ★ ★

THIS year, the American Society of Tool Engineers has recognized outstanding service to industry by undertaking to distribute to its thousands of members, with its endorsement, eight of I.D.A.'s technical articles on diamond use, for the assistance of engineers and operators.

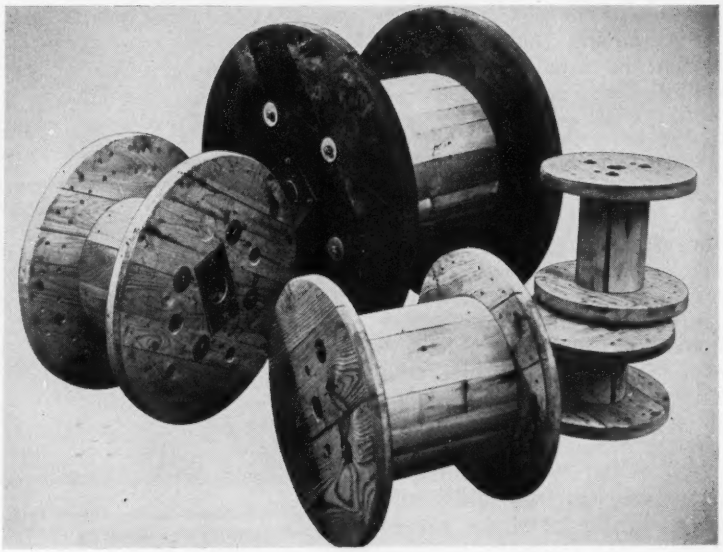
★ ★ ★

A GRAPHIC demonstration of how millions of miles of filament wire for electric lamps, radio and television tubes, x-ray, radar and electronic wires are drawn each year were part of an elaborate exhibit held at the Hotel Claridge, in Atlantic City, March 17th and 18th.

★ ★ ★

REELS made of

RETURNABLE AND NON-RETURNABLE **WOOD**



Bridge SHIPPING and SHOP REELS are furnished assembled or knocked down, made to your specifications. Built to withstand severest handling. Sturdy, strong, low in cost. Made for

CABLE, ROPE and WIRE

Made in any size, from 12" to 96" in diameter.

ALSO, REEL HEADS FOR STEEL DRUMS

Send us your specifications and let us quote on costs.

BRIDGE MFG. CO., Inc.

HAZARDVILLE • CONNECTICUT

Outstanding Personalities of the Wire Industry

Spaulding to Engage in Special Research at Permanente's New Plant

QUALITY control and the metallurgical problems of aluminum fabrication at the **Newark Kaiser Aluminum Wire and Cable Plant** will be handled by **H. S. Spaulding,** Chief Metallurgist.

★ ★ ★

MR. SPAULDING joined Permanente about a year ago and has been actively engaged in the metallurgical aspects of rod mill design. He is responsible for several revolutionary modifications in equipment and plant layout which are expected to greatly facilitate quality control to eliminate fabricating difficulties.

★ ★ ★

A BACKGROUND of ten years experience in the aluminum industry, during which he served as chief plant metallurgist for two different production plants, has brought him wide recognition as one of the outstanding technicians in the field. He has participated extensively in the activities of the Wire Association and has prepared two important works entitled "Aluminum Wire Fabrication" and "Wrought Aluminum Alloys" which are regarded as highly practical and authoritative approaches to the subjects.

H. S. Spaulding, Chief Metalurgist at Permanente's Newark, Ohio Plant

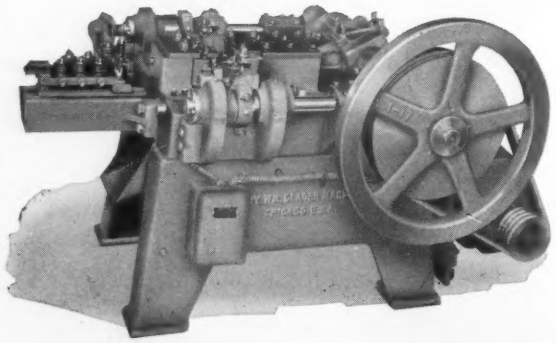
★ ★ ★

MR. SPAULDING was born in Kokomo, Indiana in 1916. His family later moved to Denver, Colorado, and he attended school at Inglewood, Colorado, a suburb of Denver. He obtained a degree in Metallurgical Engineering from the Colorado School of Mines at Golden, Colorado. During college he was elected to Tau Beta Pi, the college engineering honor society, and he is at present a member of Sigma Gamma Epsilon, a national organization of professional engineers.

★ ★ ★

IMMEDIATELY upon graduation he entered the aluminum industry. After about three years of general experience in various phases of its production he became plant metallurgist at Massena, New York, and later at the

GLADER HIGH SPEED WIRE NAIL MACHINE



MACHINE ARRANGED FOR INDIVIDUAL MOTOR DRIVE

High tonnage output, and low maintenance costs, have resulted in Glader Machines being accepted as standard equipment in every large nail mill built in the United States in the past twenty years.

Glader Machines are operating in most of the wire producing mills throughout the world.

These machines are made in eleven different types and sizes. This enables us to cover the range of sizes of nails produced with the greatest efficiency.

For further information please address,

WM. GLADER MACHINE WORKS
210 No. Racine Ave.
Chicago 7, Illinois

Export Dept.: 122 E. 42nd Street, New York 17, N. Y.

aluminum rod and bar plant in Kentucky.

★ ★ ★

IN addition to regular plant metallurgy, Mr. Spaulding's experience will be utilized in undertaking some basic research in the aluminum conductor field.

★ ★ ★

New Officers Elected by C. F. & I.

CARL W. MEYERS, President of **The Colorado Fuel and Iron Corporation,** has announced the appointment of **Alwin F. Franz** as Executive Vice President of the Corporation and its subsidiary companies.

★ ★ ★

MR. FRANZ, recently elected to The Board of Directors, has enjoyed an enviable record with CF&I. He came to CF&I in May 1945 from the Alan Wood Steel Company where he served as General Superintendent of the steel division.

★ ★ ★

ONE of Mr. Franz' outstanding virtues is his fine relationships with labor as attested by his long-standing record of fairness, understanding and ability to work with men.

★ ★ ★

Mr. Alwin F. Franz, Executive Vice President The Colorado Fuel and Iron Corporation.

ANOTHER very important announcement was made by Mr. Meyers in naming the successor of Mr. Franz. **Jay J. Martin,** Works Manager of the Pueblo Plant, was appointed Vice President in Charge of Operations for CF&I and subsidiary companies.

★ ★ ★

MR. MARTIN came to CF&I in 1926 from the Youngstown, Ohio Plant of Carnegie-Illinois Steel where he was a first helper in the open hearth department. He was made assistant superintendent in the open hearth steel department at Pueblo. He progressed to superintendent of that department and later to Works Manager when Mr. Meyers came to CF&I in 1946.

★ ★ ★

ANOTHER appointment is that of **John S. Hawley** as Assistant to the Executive Vice President, Mr. Franz. He was formerly in charge of operations in the California Wire Cloth Corporation, a subsidiary.

★ ★ ★

The SPECIALISTS in Wire - Straightening and Wire - Cutting!

Diameter Range — 1/16" to .005"

PRECISION - Our Motto

DON'T hesitate to call on us when you are confronted with wire-straightening problems involving close tolerances and absolute accuracy. For seventeen years we have specialized in straightening and cutting all gauges of fine wire, hard or soft, ranging in diameter from one-sixteenth of an inch down to five-thousandths of an inch. We employ gun-barrel accuracy in straightening lengths from one inch to ten feet or any fractional part thereof. Ends cut absolutely clean without burrs.

ASK ABOUT OUR UNEXCELLED FACILITIES FOR CLEANING AND POINTING WIRE ALREADY STRAIGHTENED AND CUT.

ALL TYPES OF WIRE...

- Nickel
- Stainless Steel
- Bronze
- Brass
- Copper
- Alloy Wire
- Music Wire
- Tag Wire
- Florist Wire

Write us today!

Manufacturers of the famous ARMA PAPER CLIP

PITTSBURGH CUT WIRE COMPANY

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TELEPHONE: CEdar 4702

A. K. McCollum Named Manager of General Electric, Coshocton, Ohio Plastics Plant

ALDEN K. McCOLLUM of Kokomo, Indiana, has been named manager of the **General Electric Company's** laminated plastics plant at Coshocton, Ohio, according to an announcement by Robert O. Bullard, manufacturing manager of the Plastics Division of the G-E Chemical Department.

★ ★ ★

MR. McCOLLUM succeeds Arthur C. Treece, who has continued to supervise operations since his appointment last October as assistant to the Plastics Division manager with responsibility for co-ordination of sales, engineering, and manufacturing of laminated products.

★ ★ ★

AN experienced plant manager, Mr. McCullum goes to Coshocton after six years as head of the General Electric's Kokomo motor plant, which was established in 1942 to produce electrical equipment for Navy destroyer escorts. The Kokomo Plant was converted to the production of fractional horsepower motors in 1944, and ceased operations on December 31, 1948.

★ ★ ★

MR. McCULLUM joined General Electric as a test engineer at Schenectady, N. Y. soon after receiving his B.S. degree in electrical engineering from the University of Nevada in 1929. After five years on the test program, he was assigned to the Large Motor and Generator Division of the Apparatus Department until 1940 when he was named supervisor of planning and wage rate for the Motor and Generator Division, at Fort Wayne, Indiana.

★ ★ ★

Portsmouth Steel Appoints Avery C. Adams Vice President

EFFECTIVE February 15th, the **Portsmouth Steel Corporation** named **Avery C. Adams** to serve as Vice President.

★ ★ ★

MR. ADAMS brings to the company a broad knowledge of the steel industry. His past experience is noted in the following statement issued by N. J. Froelich, General Sales Manager.

★ ★ ★

HE joined the Trumbull Steel Co., Warren, O., now part of Republic Steel Corp., in 1920. In 1926 he was appointed assistant general manager of sales of Trumbull. Later he served as manager of tin plate sales for Republic Steel resigning that position in 1928 to become assistant to the president of General Fireproofing Co., Youngstown, of which company he was named vice-president in charge of sales in 1930. In 1936 he joined the Carnegie-Illinois Steel Corp., Pittsburgh, as manager of sales, Sheet Division, and in 1938 resigned that post to become vice president and assistant general manager of sales, Inland Steel Co., Chicago. He was elected vice president in charge of sales

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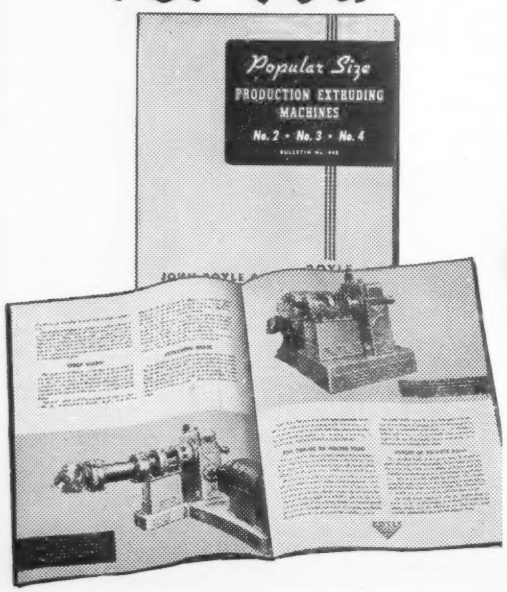
HAS PREPARED For You-



To meet the many requests for information concerning Royle "Popular Size" Extruding Machines, a fully illustrated, quick reference bulletin has been prepared describing the Royle # 2, # 3, and # 4 extruding machines—the extruders most commonly associated with current extrusion processes.

Please use the handy coupon below to order your copy of this useful bulletin. It will be sent to you promptly and without obligation.

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PIONEER BUILDERS OF EXTRUSION MACHINES SINCE

London, England — James Day (Machinery) Ltd — REgent 2430
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and to the executive committee and the board of directors of the United States Steel Corp. of Delaware, Pittsburgh, in 1939, and in 1945 resigned to become associated with Charles A. Koons & Co., New York, as an executive with the parent company and its subsidiaries.

★ ★ ★

Wire Rope Institute Elects Larkin as President

AT the annual meeting of the **Wire Rope Institute,** held January 21, **David Larkin** was elected president of the organization for a one-year term. He succeeds E. C. Low, of John A. Roebling's Sons Company, who became chairman of the board.

★ ★ ★

LARKIN, executive vice president of the **Broderick and Bascom Rope Company,** is a graduate of the University of Edinburgh, Scotland. He is widely known in the wire rope industry, with which he has been actively identified for twenty-one years. He is chairman of the advisory board, Washington University School of Engineering, St. Louis, Mo. and a fellow of the American Society of Mechanical Engineers.

David Larkin, President Wire Rope Institute.

★ ★ ★

IN addition to Larkin and Low, other new officers of the institute are: vice president, H. C. Parker, of Bergen Wire Rope Company; secretary, W. A. Huber, of American Chain and Cable Company; treasurer, D. W. Vernon of A. Leschen and Sons Rope Company.

★ ★ ★

New Industrial Relations Research Department Established by A. S. & W.

ESTABLISHMENT of a research division in the industrial relations department of **American Steel & Wire Co.** was announced recently by Francis J. Burtt, industrial relations director of this U. S. Steel subsidiary.

★ ★ ★

THE new section will be headed by **C. J. Forbes,** formerly assistant to director of industrial relations. Mr. Forbes has been

Wean Equipment Corporation
CLEVELAND, OHIO
No. 1155 Farm and Field Fence Machine
Barbed-Wire Machine
Strip Reel and Slitting Unit
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THE WEAN EQUIPMENT CORPORATION are recognized as specialists in high-efficiency and wire mill and straightening equipment.
COLD ROLLING MACHINERY
For 36" Wide Material and Narrower
MILLS - REELS - SLITTERS - LEVELERS
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BARBED WIRE MACHINES
TUBE BAR AND SHAPE STRAIGHTENING MACHINERY
WEAN EQUIPMENT CORPORATION
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associated with American Steel & Wire Company since his graduation from Harvard University in 1936.

* * *

ESTABLISHMENT of the new division has been made necessary by the increasing importance of research activity relating to labor contracts, industrial relations policies, etc., Mr. Burtt explained. These functions have been carried on informally for several years within the department, and henceforth will be centralized under Mr. Forbes' direction.

* * *

Anjeskey Heads Monorail Manufacturers' Association

AT the annual meeting of the **Monorail Manufacturers' Association,** held in Chicago, **A. F. Anjeskey,** Sales Manager of the Cleveland Tramrail Division of The Cleveland Crane & Engineering Company, Wickliffe, Ohio, was elected President. **Wilbur Mayer,** Sales Manager of the Louden Machinery Company, Fairfield, Iowa, was elected Vice-President, and **E. Donald Tolles** was elected Secretary-Treasurer.

* * *

THE offices of the Association are located at 71 West 35th Street, New York 1, New York.

* * *

A. F. Anjeskey, Sales Manager, Cleveland-Tramrail Div., Cleveland Crane & Eng'g. Co., Wickliffe, Ohio

Nickel Company Elects Officers

ROBERT C. STANLEY, Chairman of the Board of Directors of **The International Nickel Company of Canada, Limited,** has announced that on his recommendation the Board, at its meeting on February 7th, has made the following executive rearrangements in the Company:

* * *

MR. STANLEY, President since 1922, Director since 1917, and Chairman and President since 1937, continues as Chairman of the Board.

* * *

DR. JOHN F. THOMPSON, Executive Vice-President since 1936, and a Director and member of the Executive Committee since 1931, has become President.

* * *

DR. PAUL D. MERICA, Vice-President since 1936, and a Director, has become Executive Vice-

MOSSBERG **PRESSED STEEL** CORP.

Greater service from a new All Welded Steel Take Off Reel designed to meet present day requirements.

Usual maintenance expense eliminated by adoption of this new design wherein all parts are welded into one homogeneous unit.

Reel sides are embossed with radial reinforcing ribs for increased rigidity with rolled edges for additional strength and to facilitate handling.

Complete line of spools and reels for both processing and shipping all kinds of bare and insulated wires and cables. (Send for Catalogue W-104)

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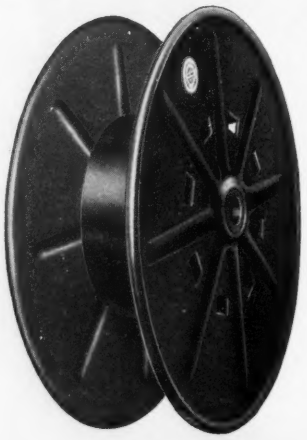


All Welded Steel
Take Off Reel

President. Henry S. Wingate, Secretary since 1939, and a Director, has become a Vice-President and continues as Secretary. There was no change among the other officers of the Company.

★ ★ ★

A. S. & W. Makes Personnel Changes at Worcester

THREE important changes in the operating personnel of the spring mill and rail bond division at South Works, Worcester, Mass., of **American Steel & Wire Co.**, are announced by G. A. Gleason, district manager of operations of this U. S. Steel subsidiary.

★ ★ ★

RAYMOND E. TIBBETTS has been named division superintendent, succeeding Harry F. Clarke, resigned. **Harold J. Elmendorf** has been appointed chief spring engineer, while **Erick R. Karlson** has been made division supervisor—production planning.

★ ★ ★

Williams Becomes Wire Mill Superintendent for Pittsburgh Steel

THE Pittsburgh Steel Company has announced the appointment of **Charles H. Williams, Jr.** as Superintendent of Wire Mills of the Company.

★ ★ ★

HE is a graduate of Monessen High School and Pennsylvania State College, Year of 1931, and entered the employ of Pittsburgh Steel Company, September 1, 1939 as Junior Industrial Engineer. He was advanced to Plant Industrial Engineer in July 1944, then to Assistant Superintendent of Wire Mills in October 1945.

★ ★ ★

Firth Sterling Moves Mosher to Detroit

H. MOSHER has been named Manager, Carbide Sales, Detroit District for **Firth Sterling Steel and Carbide Corporation.** He was Manager of the former Firth Sterling Buffalo District.

★ ★ ★

MR. MOSHER has been closely associated with the Tool and Die Industries for nearly 17 years. He is a graduate of the University of Pennsylvania, B.S. in Mechanical Engineering, and an active member of ASTE.

★ ★ ★

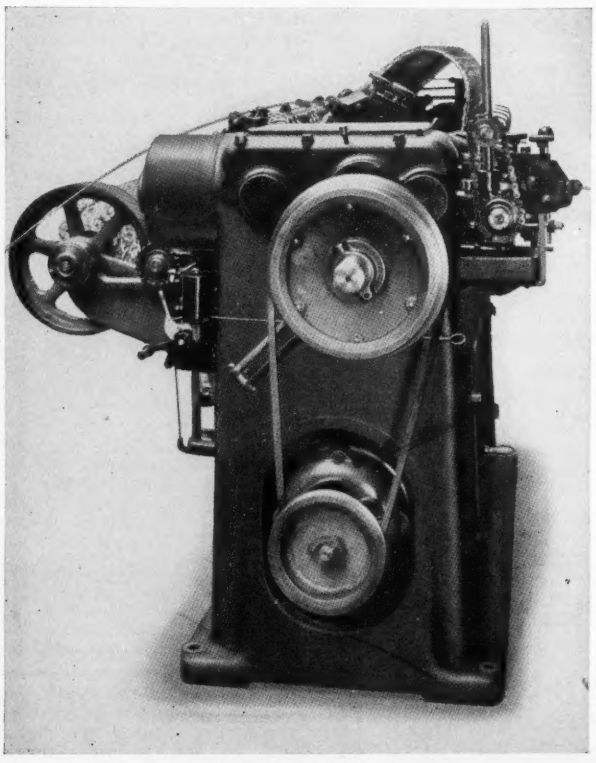
MOSHER will have charge of carbide sales, directing and assisting application engineering services to Firthite and Firthaloy users in the Detroit District.

★ ★ ★

McHugh Made Superintendent of Nail Mill at Donora

JOHN T. McHUGH has been appointed department superintendent of the nail mill at the Donora (Pa.) Steel & Wire Works of **American Steel & Wire Co.**, U. S. Steel subsidiary.

★ ★ ★



ENORMOUS PRODUCTION ON CHAIN LINK FENCING

BLASHILL MACHINES

are incomparably superior in output, in economy of Factory space, and in low costs for labor, power and maintenance.

30% TO 50% HIGHER PRODUCTION.

Thoroughly modern in design. All bearings "Ball" or "Roller". Accurate and positive automatic controls.

Fifty years' experience in Fence Machines and Fence are behind them. Tell us your needs for fence production.

ARTHUR BLASHILL

WOODSTOCK,
ONTARIO, CANADA

(Formerly at Birmingham, England)

A Review of Recent Wire Patents

NO. 2,460,570, GRINDING MACHINE, patented February 1, 1949 by Pliny Catucci, Kearny, N. J., assignor to William Crabb & Company, Newark, N. J., a corporation of New Jersey.

The machine is for sharpening the ends of rods and pieces of wire and the like and comprises a plate having parallel grooves therein for the rods or wire, and revoluble spiral guides spaced from the grooves adopted to receive the rods or wire and move them laterally while maintaining them in parallel relation.

★ ★ ★

NO. 2,460,688, APPARATUS FOR LOCATING FAULTS IN CABLES, patented February 1, 1949 by Richard D. Gambrill and Clay E. Lewis, Baltimore, Md., assignors to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

More specifically, the apparatus is for locating high-resistance faults in the insulating jackets surrounding wire conductors.

★ ★ ★

NO. 2,460,951, BENDING MACHINE ABUTMENT GUIDE, patented February 8, 1949 by Horace M. Shuff, Tampa, Fla.

This guide is adapted for use with rod-bending machines and adjustable for rods of various diameters.

★ ★ ★

NO. 2,461,030, METHOD OF MAKING TORPEDO NETS, patented February 8, 1949 by Alan E. Brickman, New Haven, Conn., assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

In the construction of the net a pair of wire strands is intersected by another pair of the same and all are connected at the intersection by a slip clip. The method includes cold pressing the clip into tight contact with the crossed wire strands so as to hold them against relative movement but insufficient to prevent slippage at applied loads, and welding the clip arm together.

★ ★ ★

NO. 2,461,031, TERMINAL FITTING, patented February 8, 1949 by Alan E. Brickman, New Haven, Conn., assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

The fitting is adapted for stranded wire and includes a spherical projection on the wire and a one-piece clevis held in place by the projection.

★ ★ ★

NO. 2,461,036, STAINLESS STEEL POLISHING, patented February 8, 1949 by Irvine C. Clingan, Baltimore, Md., assignor, by mesne assignments, to Armco Steel Corporation, a corporation of Ohio.

For rapid and continuous production of polished stainless steel wire, rods, sheet and strip having about 10% to 35% chromium, at least about 0.25% carbon and the remainder essentially iron, the inventor proceeds, in the case of the wire, by establishing anodic connection to the wire, and lineally moving the same through an acid bath consisting, by weight of about 50% to 70% concentrated orthophosphoric acid (sp. gr. 1.7), about 10% to 30% concentrated sulphuric acid (sp. gr. 1.84), about 1% to 20% diethylene glycol mono-butyl ether, and any remainder being all water, while maintaining a current density of at least about 5 amperes per square inch of product surface and a bath temperature between about 125°F. and 165°F.

★ ★ ★

NO. 2,461,647, APPARATUS FOR APPLYING PLASTIC MATERIAL TO CABLES, patented February 15, 1949 by Leroy W. Lovett and Sloan S. Sherrill, Baltimore, and August Stiegler, Towson, Md., assignors to Western

Complete Description and Drawings of Patents May Be Had for 50 cents, outside the United States and Canada $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

We'll gladly **SPLIT A HAIR** for you . . .
and gold-plate it, too!

FINE Wire Headquarters often gets the darndest problems . . . solves 'em, too! Here's a typical example:

A manufacturer of special-purpose electronic tubes required a quantity of .00028 fine Tungsten wire, which is 1/10th the diameter of a human hair. And this had to be plated with a coating of gold to a uniform thickness of .000006. Uniformity of the goldplating was as important to performance characteristics of the wire as the exact diameter of the wire itself.

Fine Wire Headquarters accepted this challenge, went to work and delivered this gold-plated hair-splitting assignment to the customer's complete satisfaction.

* * * *

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So, when you have a problem on Fine Wire, Tungsten, or Molybdenum why not call on Fine Wire Headquarters? Phone, wire or write to North American Philips, makers of NORELCO Fine Wires and ELMET Tungsten and Molybdenum products.

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Export Representative • Philips Export Corporation • 100 East 42nd Street, New York 17, N. Y.

Electric Company, Incorporated, New York, N. Y., a corporation of New York.

The apparatus is adapted to pour the material onto the advancing wire in a regulated stream.

★ ★ ★

NO. 2,461,809, ZINC ELECTROPLATING, patented February 15, 1949 by Allen E. Chester, Highland Park, and Frederick F. Reisinger, Waukegan, Ill., assignors to Poor & Company, Chicago, Ill., a corporation of Delaware.

Particularly bright electrodepositing is effected by employing an aqueous alkaline cyanide-zinc plating bath containing a sufficient amount of dissolved product of the reaction of piperonyl aldehyde and an aldonic acid to enhance brightness.

★ ★ ★

NO. 2,461,831, PRINT-HANDLING DEVICE, patented February 15, 1949 by Louis Phillip Martinek, Cleveland, Ohio.

This device (for handling photographic prints) is constructed wholly of bent wire.

★ ★ ★

NO. 2,462,149, PROCESS FOR TREATMENT OF CABLE INSULATED WITH THERMOPLASTIC MATERIAL, patented February 22, 1949 by John Krauss Webb, London, England, assignor, by mesne assignments, to International Standard Electric Corporation, New York, N. Y., a corporation of Delaware.

The gas in the voids of the insulation surrounding the wire cable is eliminated by this method.

★ ★ ★

NO. 2,462,191, METHOD OF WINDING COILS, patented February 22, 1949 by John K. Hodnette and Allan D. Forbes, Sharon, Pa., assignors to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania.

A number of winding coils of insulated wire are simultaneously wound by this method upon a hollow tube of insulating material.

★ ★ ★

NO. 2,462,209, RESINS AND CONDUCTORS INSULATED THEREWITH, patented February 22, 1949 by Herbert F. Minter, Pittsburgh, Pa., assignor to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania.

Wire conductors are insulated with a composition composed of the reaction product of castor oil with both an acyl halide having from 6 to 20 carbon atoms and an alpha, beta-olefinic dicarboxylic acid, the acyl halide and alpha, beta-olefinic dicarboxylic acid esterifying the major proportion of the hydroxyl groups of the castor oil, the castor oil and alpha, beta-olefinic dicarboxylic acid being reacted to produce only the acid half ester with at least one hydroxyl group on the average per castor oil molecule.

★ ★ ★

NO. 2,462,316, COMPRESSED WIRE MESH UNIT, patented February 22, 1949, by Alfred M. Goodloe, Montclair, N. J., assignor to Metal Textile Corporation, West Orange, N. J., a corporation of Delaware.

This device embodies a self form-sustaining body of compressed and molded knitted wire mesh fabric, wherein the fabric is formed to provide a number of radially extending pleated folds initially upturned and laterally overlapped to extend parallel to the longitudinal axis of the formation, these folds being collapsed upon themselves in direction of their length into compacted interentangled and interlocked relation forming a dense body mass possessing compressible elasticity under loads less than that of the forming pressure or load.

★ ★ ★

NO. 2,462,393, COIL-WINDING MACHINE, patented February 22, 1949, by Nathan M. Haynes, New York, N. Y.

(*Please turn to page 373*)

When you write an ADVERTISER for prices and information, PLEASE MENTION the fact that you saw his ad in WIRE AND WIRE PRODUCTS. It identifies your inquiry and expedites service.

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THE NATIONAL FOREMAN'S INSTITUTE, Deep River, Conn., has issued a 32 page pocket-size booklet entitled "How Supervision Can Explain the Economics of Business." This unusual publication provides information on executives, profits, government, capitalism, advertising, stockholders, job security and the American System in such manner that foremen and employee supervisors will have material for answering and counseling employees on a man-to-man basis.

★ ★ ★

IT is something that can be used to good advantage in practically all businesses or industries to promote a better understanding on what goes on in business and how we all work as a team to get along.

★ ★ ★

CONCERNS desiring copies may write to the Foremen's Institute for prices in quantity.

★ ★ ★

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Electric Wire Industry In R. I. Holds Line on Wartime Gains

THE electric wire producing industry in Rhode Island is holding tenaciously to the gains chalked up in wartime as this segment of industrial economy had had a 50 per cent growth since 1939 and is still going strong.

★ ★ ★

THERE was a slight drop during December but this is regarded not so much as a trend but an expected seasonal decline. Wire men take it as an indication that the industry is getting back to normal. They are of the opinion that the 5000 persons or so it employs may look forward to continued employment for some time in the dozen or more factories around the state.

★ ★ ★

THESE factories turn out a varied product—house wiring, cord set wire, overhead and underground power cable, multiple wire cable, hair-like wire used in searching for oil both on land and under water, automobile electrical wiring sets and many types of insulation.

★ ★ ★

THE wire producing factories form the major part of the state's electrical and equipment industry which gives employment to 5500 persons as compared to 3600 in 1939.

★ ★ ★

THE horizon poses some vexing problems, the wire men admit. For instance—how will the industry and business in general react to President Truman's new administration policies? Will the copper shortage continue? Are prices on wire and cable going to continue on a downdrift?

★ ★ ★

ON the optimistic side of the picture, however, are the expansion plans of many industrial plants with consequent benefit to all. All in all, the electric wire industry, in Rhode Island at least, views things through rose-colored glasses.

★ ★ ★

Cleveland Crane and Engineering Company Bought by Akron Firm

THE Cleveland Crane & Engineering Company Wickliffe, Ohio, has been purchased outright by **The McNeil Machine & Engineering Company** of Akron, Ohio.

★ ★ ★

PLANS have already been made to continue operating Cleveland Crane as heretofore, with no changes in over-all management, organization, or policies. For all practical purposes the company name will remain the same. The only change contemplated is merging the two companies with the thought that later on stock of the combined companies will be offered to employees and the public.

★ ★ ★

THE Wickliffe, Ohio, firm was organized in 1899 as the Cleveland Crane and Car Company, and from the very beginning has been engaged in the manufacture of heavy overhead traveling cranes, which still continues to be an important part of its business. In 1919 the Cleveland Tramrail line of overhead materials handling equipment was developed. Because this equipment could efficiently serve a wide range of industrial handling needs, the demand for it grew rapidly and as a result Cleveland Tramrail has become the most important from the standpoint of dollar sales of Cleveland Crane products.

★ ★ ★

Booklet Describes Activities of Murex Ltd., of England

MUREX, LTD., Rainham, Essex, England, has produced a handsome 24 page booklet presenting a brief outline of their metallurgical and chemical products and their uses in industry. They produce the raw materials for the manufacture of welding rods, tungsten carbide, tungsten vanadium, molybdenum, chromium, copper, tin, titanium, manganese, aluminum powder, nickel, tantalum, boron, cobalt and alloys of metals involving these elements, besides many products listed in the last pages of the booklet.

★ ★ ★

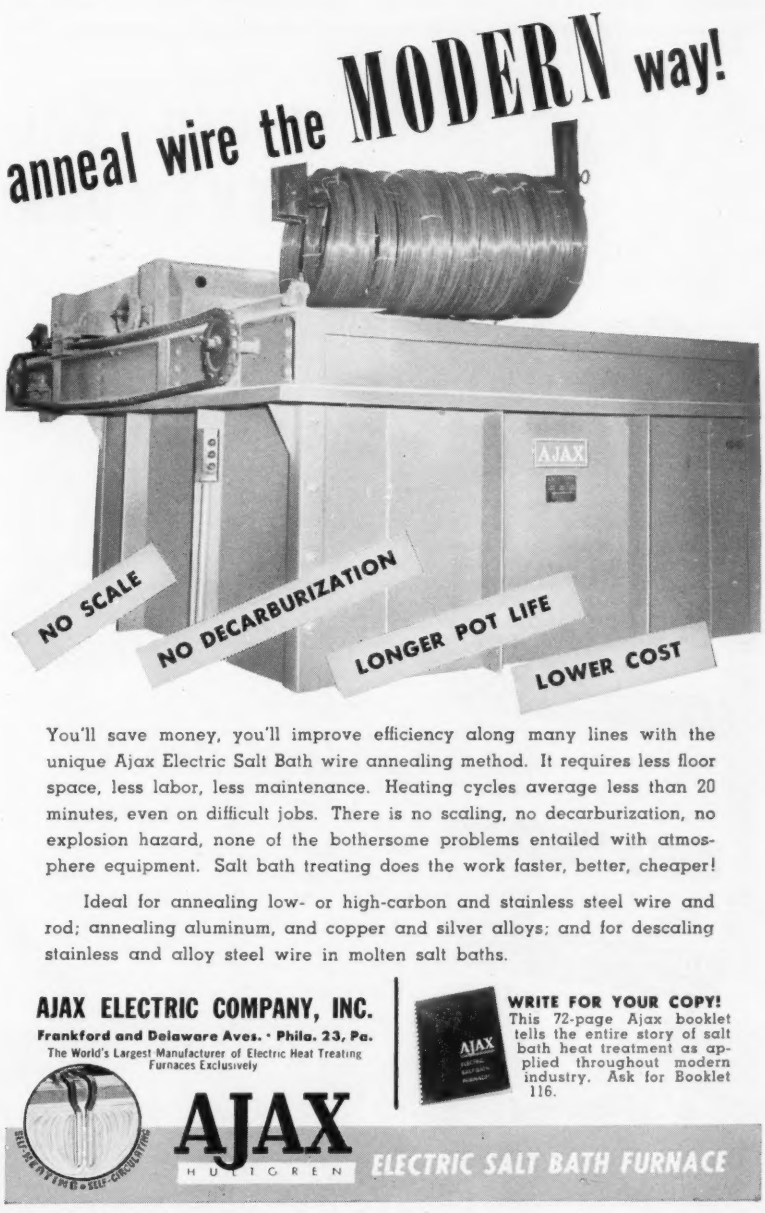
COPIES of this booklet may be obtained by writing them. It is available in English, Spanish and French.

★ ★ ★

Booklet Describes Laboratory Equipment

EBERBACH & SON COMPANY, Ann Arbor, Mich., have issued No. 49-1-33 of the Eberbach Announcer, which gives information on demineralizers, vacuum pumps, shakers, homogenizers, scales, timers, filters, combustion tubes, aniline point apparatus and microscopes—all designed for laboratory use. Supporting these product listings are technical treatises on the use of the equipment. The subjects treated represent only a small part of their complete line. You are invited to write for this particular bulletin—or their complete catalog.

★ ★ ★



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Surface Combustion Issues Folder on Standard-Rated Furnaces

A NEW 8-page folder has been prepared by **Surface Combustion Corporation,** Toledo, Ohio to describe its line of Standard-Rated Industrial Furnaces.

★ ★ ★

THE booklet, printed in two colors and copiously illustrated, provides an excellent survey of the broad line of Standard-Rated 'Surface' Furnace Equipment.

★ ★ ★

EQUIPMENT for a broad range of processes is presented, including hardening, tempering, forging, metal melting, air heating, etc. The folder provides an excellent survey of what is available in standard equipment, with designs completed and parts in stock, for rapid delivery. This equipment offers the advantage of rated performance, based upon design and extensive operating data such that the number of pounds of steel heated per hour, at a predetermined rate of gas consumption, can be accurately specified. Providing a useful summary of 'Surface's' extensive line of industrial furnaces, this bulletin (SC-141) should be a handy reference piece for all men concerned with furnace selection.

for fast, uniform stranding

RIGID TYPE STRANDER

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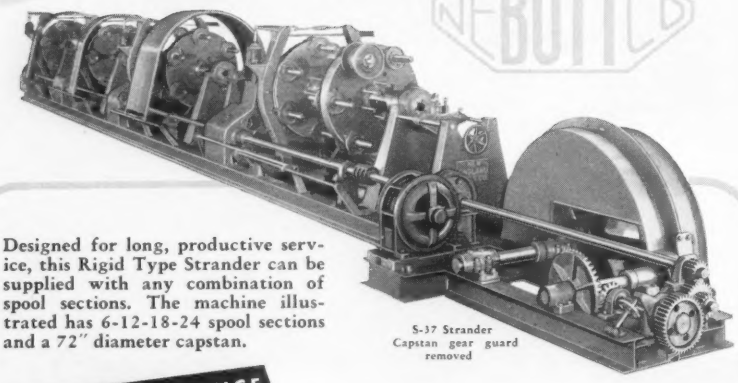

S-37 Strander
Capstan gear guard removed

Designed for long, productive service, this Rigid Type Strander can be supplied with any combination of spool sections. The machine illustrated has 6-12-18-24 spool sections and a 72″ diameter capstan.

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Anti-Friction Bearings on Line Shaft and Reel Mountings
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Precious Metal Weight Calculator

SECON Metals Corporation, 228 E. 45th St., New York City, offers the Secon Precious Metals Weight Calculator to industrial users of precious metals.

★ ★ ★

THIS calculator rapidly computes the weight of platinum, palladium, gold and silver—in the forms of sheet, wire, tubing and circles. Answers are given in Troy ounces. It will also give the weight per foot and number of feet per Troy ounce of wire.

★ ★ ★

ALL this reckoning is done with an instrument which operates on the slide-rule principle. One or two settings and the problem is solved.

★ ★ ★

THE Secon Calculator can also be used to approximate the weights of other metals which have similar densities to the four metals listed above.

★ ★ ★

SECON Metals Corporation is a new firm in the precious metals field, engaging in the sale and processing of platinum metals and alloys. Products include platinum and other non-ferrous metals manufactured in the forms of sheet, wire and foil for industrial application, as well as special forms for particular needs.

★ ★ ★

THIS firm, specializing in drawing wire to very fine sizes, has been established by Mr. Sidney Cohn and his son Eugene. Offices and plant are located at 228 E. 45th Street, New York City.

★ ★ ★

MR. COHN, a former partner of Sigmund Cohn and Company, New York City, entered the platinum business in 1913. He served on platinum committees of the national OPA and WPB during World War II.

★ ★ ★

HIS son, Eugene, a graduate of Brown University, is a member of the American Society for Metals, American Chemical Society and The Wire Association.

★ ★ ★

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The 5th in a series of letters, addressed to the Wire Drawing Industry.

THE Diemakers Committee of the **Industrial Diamond Association of America** intends to supply for this column, each month, information which wire manufacturers indicate they would like to obtain. This may concern new processes or new methods of handling the dies for better die life, or it may be in the nature of answers to specific questions.

★ ★ ★

QUESTIONS from wire manufacturers would be particularly timely during the spring and summer, inasmuch as it is planned to hold a lecture and symposium on wire drawing with diamond dies at the next Convention of the Wire Association in October, 1949. Participants in this symposium are to be practical men in the wire as well as in diamond die production and service. They will be in a position to give answers from the floor, by means of the particular member of the group who feels that he can supply satisfactory information to any particular inquirer. Questions and answers in this column might well form the basis for deciding upon some of the problems to be discussed in this feature of the Wire Association's Convention program.

★ ★ ★

IT is suggested that questions be sent to the Editor of **Wire and Wire Products.** The queries will be forwarded to the **Industrial Diamond Association.**

★ ★ ★

AN interesting exhibit took place in Atlantic City on March 17th and 18th in connection with the Annual Convention of the Industrial Diamond Association. As with all of the principal segments of the industrial diamond industry, the diamond die segment presented to the public diamonds and diamond dies, and indicated how rod is reduced through dies of various sizes, down to the almost invisible wire. The exhibit also presented to the public the mechanical and electrical parts made from these wires. Then, traced such products of the dies through to miniature models of the everyday conveniences enjoyed by all citizens: automobiles, household appliances, telephones, and the hundreds of other resulting products, including those for warfare.

★ ★ ★

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WIRE DIES and TOOLS
with HYPREZ
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Effective techniques for finishing and refinishing with Hyprez Diamond Compounds are described and fully illustrated in this new folder. The methods show fast, perfect, economical results employing one or more of our 25 engineered standards.

Hyprez Diamond Compounds are formulated of precision graded, fast cutting, virgin diamond powder in a patented base that will not fly off tool or die and which is stable and uniform at all normal temperatures.

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One of these two M & T chemicals will meet all your liquor finishing or immersion plating requirements . . . whether for acid or alkaline . . . white or bronze finish baths.

STANNOCHLOR and STANNOUS SULPHATE are stable . . . will not deteriorate with age in summer or in winter. Their use makes it possible to keep a stock on hand at all times . . . permits purchasing in large quantities for economy.

And, because they contain no water of crystallization, STANNOCHLOR and STANNOUS SULPHATE go further pound for pound.

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Bulletin Covers Acid-Proof Products

A SIX-PAGE bulletin describing two acid-proof products has been published by **Sauereisen Cements Corporation.** It pictures applications of their cements and sealers in pickling tanks, floors, smoke stacks, etc. Data as to characteristics of the products, prices and quantities required for jobs are included.

★ ★ ★

FOR your copy, please write the company, Sharpsburg Station, Pittsburgh, Pa.

★ ★ ★

Admiral Moreell Raises Question on Federal Tax Law Changes

A PLAN to help the steel industry modernize faster was suggested in January by **Admiral Ben Moreell,** President of **Jones & Laughlin Steel Corporation.**

★ ★ ★

HE proposes a change in the federal tax law to allow companies to write off the cost of new equipment more rapidly than they may now.

★ ★ ★

"THE change is needed," he said, because " . . . the present tax system doesn't take account of the rising price of equipment. We are allowed to make deductions for the higher costs of operating materials and labor. But the tax law gives us no relief for costs of plant and equipment and they have more than doubled.

★ ★ ★

"FOR all the apparent prosperity we have today, industries that are keeping pace with America are caught short of cash. What we have been able to lay aside for replacement does not begin to meet what we must spend for new plants. During the last three years Jones & Laughlin has spent $104,000,000 to replace and improve its plants. And we are already committed to spend $106,000,000 more in the next four years. We can't use yesterday's tools for today's work and be in business tomorrow."

★ ★ ★

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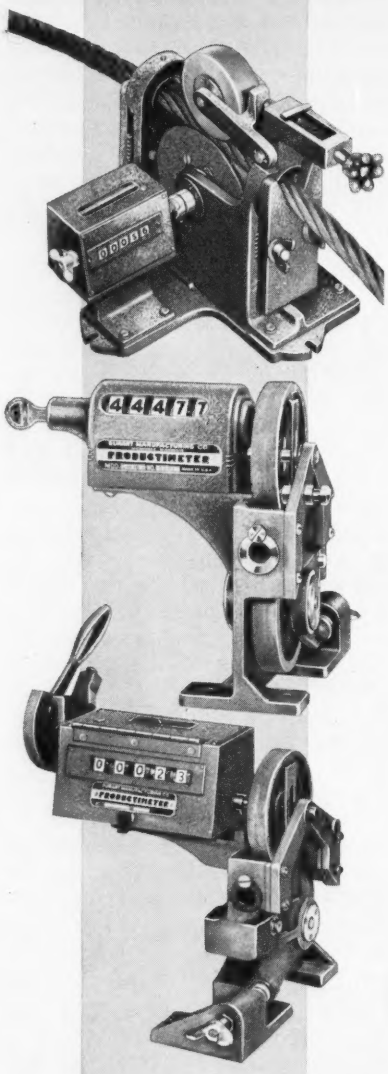
Fast . . Accurate . . Dependable . . Legible



Productimeters measure all types of wire from .010 to 3½ inches in diameter . . . at speeds up to 5,000 feet per minute. They eliminate "guess-work". . . insure profitable operation in your plant.

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PRODUCTIMETERS

SINCE 1879 Speedometers OF INDUSTRY

JONES & LAUGHLIN, like other steel companies, has borrowed vast sums for modernization and increasing capacity since the war's end. The company has also drawn so heavily upon profits that "the common shareholder is now receiving an annual return of less than 3 per cent on the asset value of the stock."

★ ★ ★

"OUR company will need more cash, and be assured that the problem is not ours alone. My proposal to meet this need is a simple one and a fair one for government and business alike. At present companies write off the cost of equipment over the period of its useful life. I suggest a change in the federal tax law to allow them to write off or amortize the cost in shorter time. I propose that companies be allowed to write off up to one-half of equipment costs within one to five years, as they choose, and that they be allowed to deduct this amortization from taxable income. There should be a limit on the amortization deducted in any one year. I propose it be set at one-half the taxable income for that year before the amortization is deducted. Perhaps such a change should be considered a temporary measure to cover only the present period of need."

★ ★ ★

ADMIRAL MOREELL told how the change would have affected Jones & Laughlin if it had been law in 1948:

★ ★ ★

"OUR profit for the year would have been cut $14,880,000 and our taxes would have been cut by $9,120,000. But this tax cut would have been only one-fifth of what we spent on plant in that year. Under this proposed change, the government would not lose tax money in the long run. Reductions during this period would be no more than a deferment of payment. If a company used up its tax deduction for write-off of plant now, it could deduct less from taxable

DILLON

The Dillon Tester is designed expressly for low range critical testing of wire, either solid or stranded in ounces—tenths—kilos. Actually has four scales instead of the usual one or two, divided 0-10 lbs., 0-25 lbs., 0-50 lbs., 0-100 lbs. Comes furnished with stepless speed motor providing draw bar travel of from 0" to 20" per minute—forward or reverse. Has automatic limiting switches, stress-strain recorder, elongation scale and steel stand.

The Dillon multi-low-range universal tester is the most modern, accurate, economical and scientifically calibrated testing machine available today.

TYPE	RANGE	DIVISIONS
Ounces	10 lb. to 100 lb.	1 oz. to 8 oz.
Tenth lb.	10 lb. to 100 lb.	.05 to 5 lb.
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★ Calibrated pendulum accuracy for tensile, shear, transverse and compression tests. Supplied with standard 12" daylight opening; 24," 36," 48" available.

Instant reading on large clear dial. Unsurpassed in accuracy among all pendulum measuring devices—precise to ½ of 1%—calibrated by dead weight. Linear spread on all models, 14½" to 22¾".

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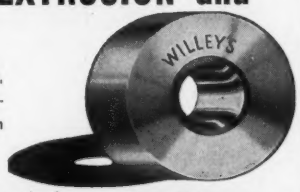

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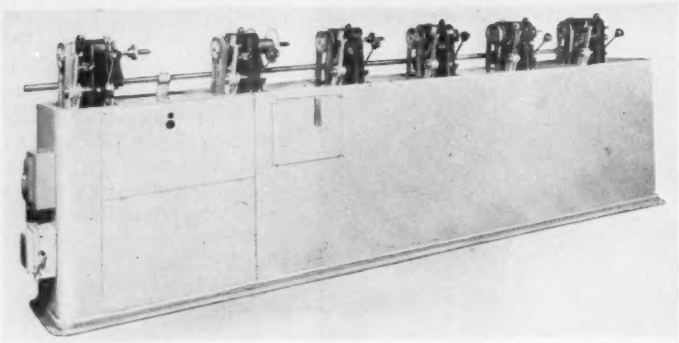

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All Emory Spoolers supplied standard or equipped to meet customers' special specifications.

On Spooling problems, consult

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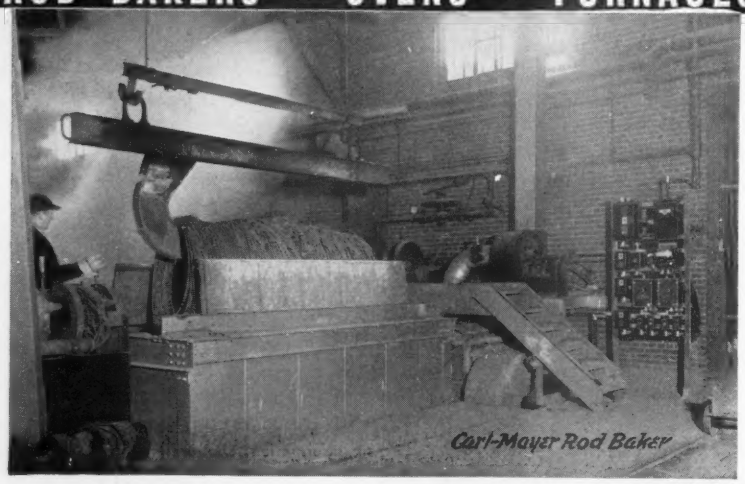

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THE CARL-MAYER CORPORATION

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CLEVELAND, OHIO

income in future years. Uncle Sam would not lose. He would, in fact, gain because the nation's industry will be able to produce more and thus be able to pay more taxes. The nation as a whole would gain in stronger industries which would have a chance to build for emergencies. And stronger industries will assure protection of employment, production, and shareholders' investments."

★ ★ ★

THE proposal is contained in a letter sent to all J.&L. shareholders and employees. It closes with a suggestion that those who agree with the proposal should write to those who represent them in Congress and suggest that they support it.

★ ★ ★

Discussions on Welding for Wire Drawing

(*Continued from page 338*)

Mr. Lees

IT occurs to me that the greater the magnesium content of an aluminium alloy, the greater will be the forging pressure required. I should also expect that the forging period might present a little more difficulty.

★ ★ ★

Mr. Hutchinson

The forging pressure is definitely determined by the rigidity of the metal to be welded. If you use pressures as heavy as are required for steel you may possibly distort the metal. Higher pressure would be needed on the alloy in the hard condition, than in the soft condition. If I may quote the case of welding B.S. AW5 and AW6 in half hard condition with elongation of about 5% as against AW6 in soft condition with elongation 18%.

★ ★ ★

Dr. Goodacre

I UNDERSTAND that a good flush fitting of the two butt ends is essential to create the

maximum resistance. I should like to know just how critical is the surface smoothness of the butt ends, would a surface obtained by filing be suitable, and what would be the effect of using a rough file as against a smooth one.

★ ★ ★

Mr. Hutchinson

IT is necessary to avoid having any metal proud of the butt faces as this would prevent the ends being in full contact and would result in a slight explosion or "flash" at that point of contact, and this would give a weld variation. On the other hand, you must have a certain amount of high spots to create resistance; if the two faces were burnished you would require more current than with slightly rough faces because the rough faces would create a higher resistance than would the burnished faces. The standard type of second-cut file would be quite suitable, keeping in mind that the "weld faces" must be parallel.

★ ★ ★

WHEN asked if he could give any information on the technique of welding cold worked aluminium as against annealed aluminium, Mr. Hutchinson replied:-

★ ★ ★

"THE type of welding which we are discussing—butt welding—is resistance welding, and it should be remembered that in this method the amount of current used depends upon the specific resistance of the metal to be welded. The lower the specific resistance of the metal, the greater is the current required. The application of cold work to aluminium usually increases its specific resistance whilst subsequent annealing would reduce it. Therefore, more current is required to weld annealed aluminium than is the case for hard drawn metal."

★ ★ ★

IN reply to a question on the size of wire which may be welded satisfactorily, Mr. Hutchinson said:

★ ★ ★

Sjogren

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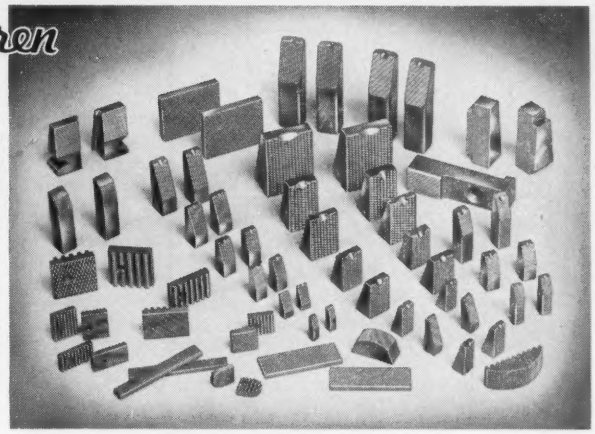

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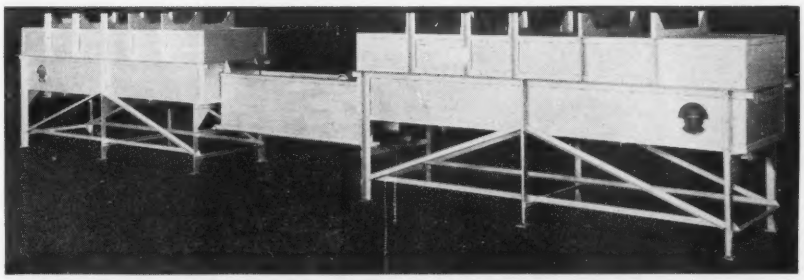

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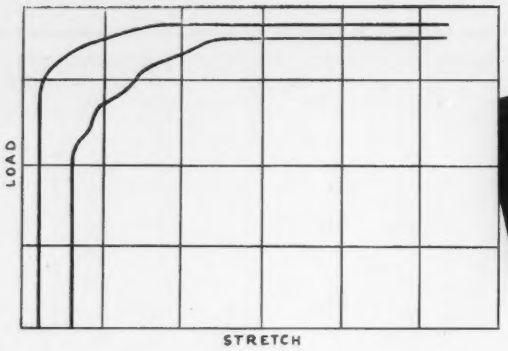

WHICH ARE YOU SHIPPING?

SMALL but significant differences can mean GO or NO-GO in your customers' use of your wire. Know what they want. Know that you are giving it to them.

*Scott Testers test wires from 0 to 1 ton tensile, giving the results in "picturized" charts that furnish a permanent file for production control and future reference.

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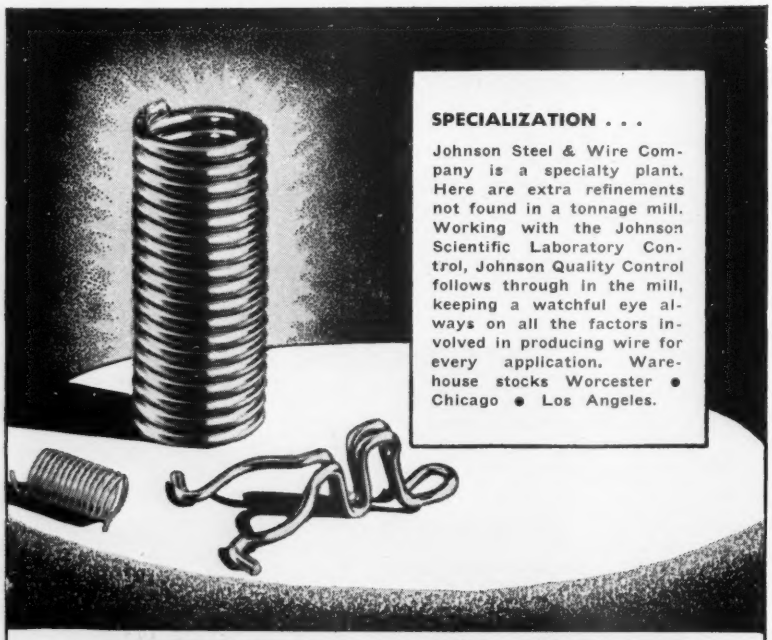
SCOTT TESTERS, INC. 55 Blackstone Street Providence, R. I.

Scott Testers — Standard of the World



SPECIALIZATION . . .

Johnson Steel & Wire Company is a specialty plant. Here are extra refinements not found in a tonnage mill. Working with the Johnson Scientific Laboratory Control, Johnson Quality Control follows through in the mill, keeping a watchful eye always on all the factors involved in producing wire for every application. Warehouse stocks Worcester • Chicago • Los Angeles.

JOHNSON

STEEL AND WIRE COMPANY, INC.

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NEW YORK PHILADELPHIA CLEVELAND DETROIT AKRON CHICAGO
ATLANTA HOUSTON TULSA LOS ANGELES TORONTO

"AT the present time we can only weld down to 10 s.w.g. but it should be remembered that the technique is still being developed."

★ ★ ★

Mr. Coates

IS it possible to weld aluminium satisfactorily without annealing the weld as in the case of steel wire?

★ ★ ★

Mr. Hutchinson

IT is possible to weld aluminium wire without annealing, but this point depends upon the physical characteristics of the particular alloy. The draw test should be a guide to the required welding conditions.

★ ★ ★

Dr. Goodacre

CAN the separate process of annealing the weld be avoided if the wire is cooled slowly after welding.

★ ★ ★

Mr. Hutchinson

YOU cannot very well cool a weld in aluminium slowly, owing to the fact there is always a tendency for the Heat to dissipate quickly from the weld zone into the clamping dies.

★ ★ ★

Dr. Goodacre

IS resistance butt welding satisfactory for age hardening alloys of the duralumin type, for instance B.S. 2L37?

★ ★ ★

Mr. Hutchinson

WE have not resistance butt welded duralumin satisfactorily yet, but as I say the technique is still being developed. There are a very large number of alloy specifications and the conditions under which one alloy may be welded will not necessarily be applicable to another.

★ ★ ★

Mr. Peter Smith

DO we understand that duralumin is not welded by the ordinary resistance butt welder?

★ ★ ★

Mr. Hutchinson

I DO not say that it is not possible but I do not know of it being done on a production job.

★ ★ ★

Mr. Bedford

WE find the removal of weld burrs more difficult in the case of aluminium than steel. The aluminium, being soft, tends to give way under the grinder and merely becomes flattened on the wire surface. Do you know of a method more suitable than grinding for the removal of these burrs?

★ ★ ★

Mr. Hutchinson

I THINK that some form of stripping or scraping instrument would be more successful than a grinder for very soft metals. Welding for wiredrawing as far as aluminium and aluminium alloys are concerned is still definitely in its infancy, and the only way in which we can develop first class production work is by the Welding Engineer, the Metallurgist and the Wiredrawer to get together on the problem.

★ ★ ★

Mr. Peter Smith

IT would seem that progress can best be made by acquiring a welder of the right capacity and experimenting with it at the wire mill.

PART III will be published in the May issue of Wire and Wire Products.

★ ★ ★

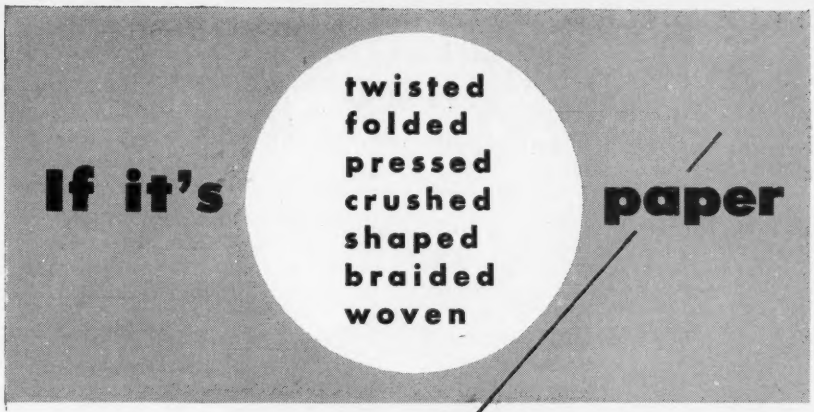
Electric Equipment for Wire Winders

(*Continued from page 327*)

d-c bus and the current regulator controls the field of the d-c motor to hold the current constant. The d-c bus voltage would normally be proportional to wire speed perhaps being the same as the capstan drive power source. The regulator may be either electronic or Amplidyne.

★ ★ ★

A DYNAMIC breaking system utilizing an a-c wound rotor motor also can be used. With a system of this type, the pay-off reel is coupled to a wound rotor motor with resistance in its sec-



TWITCHELL makes it

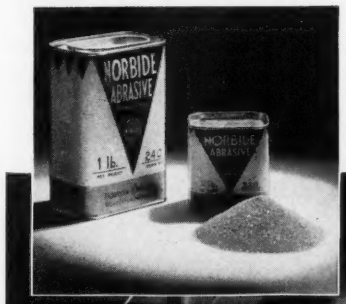
treated braiding and wrapping yarns wound single or multiple ends parallel for new high-speed Abbosealed process or standard braiding equipment.

treated wire-rope cores

waxed cable-fillers for 2- and 3-wire non-metallic sheathed cable and shipboard cable, etc.

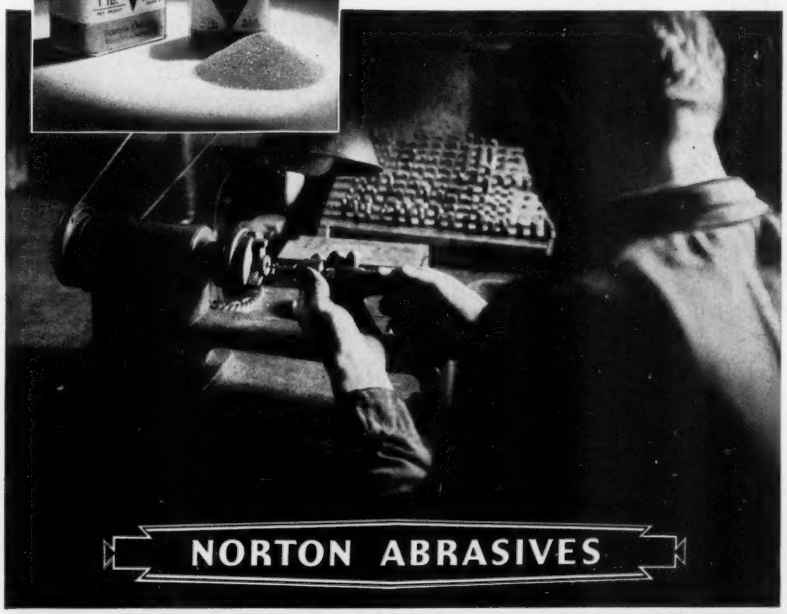
E. W. TWITCHELL INC.
Third & Somerset Streets
Philadelphia 33, Pa.

NORBIDE Abrasive: Effective, Economical

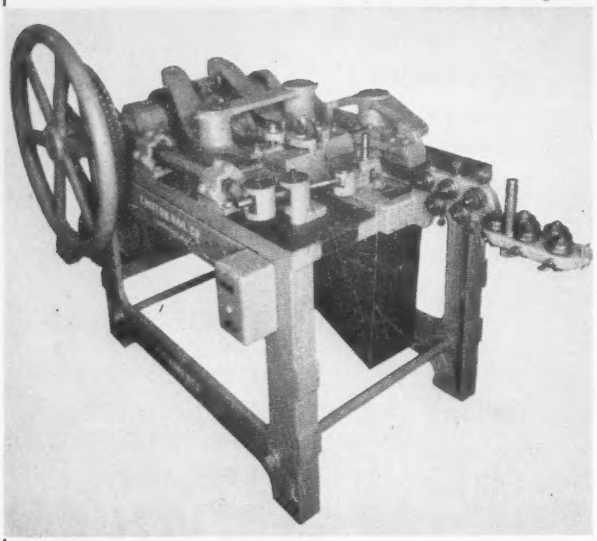


This abrasive—second only to the diamond in hardness and 150 times less expensive—does an efficient job of cutting and semi-finishing cemented carbide wire drawing dies.

NORTON CO. — Worcester 6, Mass.



PROMPT DELIVERIES ON
"ENCO"
WIRE NAIL MACHINES



Easy To Set Up And Operate.

Furnished belt drive or with motor including V belts, starter, etc.

No. 2 size will cut 180 lbs. per hour of 8d common or 12 kegs per 8 hr. day running 300 R.P.M.

Write for prices, stating size and number of machines wanted.

EASTERN NAIL COMPANY
55 ALEPPO STREET • PROVIDENCE 9, R. I.

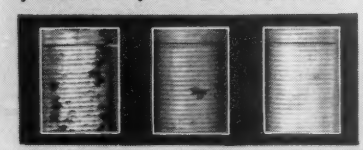
REVOLUTIONARY New Method of
Rust Control

Outperforms other more complex, more costly "preventives". Answers problems never before solved. CLEAN, SIMPLE TO USE!

Eliminates Slushing in Oil – It's . . .

Angier VPI* Wrap
*Vapor Phase Inhibitor developed by SHELL

PROOF: Identical steel parts exposed 9 months to industrial-marine atmosphere. These photos are unretouched.



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ondary and d-c excitation on two of the primary lines. For small values of secondary resistance, the speed torque characteristic very closely approaches that for constant tension. The disadvantage of this system is that the power is wasted into the resistor.

★ ★ ★

SOMETIMES the unwinding reel drive will be required to motor on acceleration or even during steady state conditions where the frictions in the system is greater than the desired tension drag. Similarly, it might be required to regenerate or dynamic brake during steady state or decelerating conditions. Fig. 21 shows a drive that can be used to meet these conditions utilizing a dancer roll as described previously. Here again the desired tension in the wire is determined by the weighted roll. Its movement is coupled to a mid-tapped potentiometer and the reel motor is amplidyne supplied, so that motion over one half of the potentiometer calls for forward speed and over the other half of the potentiometer calls for reverse speed of the reel motor. As can be seen, this drive can also maintain stalled tension in the event the capstan stops. In fact, should the capstan reverse, the reel will reverse and will run in the reverse direction to maintain tension, and then will fall into application Type No. 1.

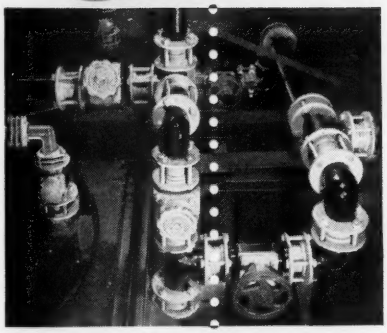
★ ★ ★

Application Types 5 and 6

APPLICATION types 5 and 6 cover rewinding from one reel to another, with and without an intermediate capstan. These two types combine portions of the other application types. When the reel is unwinding, its functions are similar to the unwinding reel described in application Type 4. When the reel is winding its functions are similar to these winding reels discussed. Drives of this sort usually involve special conditions which make their discussion impractical in this article, but they can be solved by combining the methods and utilizing the basic tools already covered.

★ ★ ★

Now you can
FORGET ABOUT
Corrosion



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Make your process equipment of HAVEG—and you can forget about corrosion! HAVEG is a different molded structural material that resists chemical action *through its entire mass.* Not just a lining or coating, its utility is not affected by surface gouges and abrasion. Moreover, HAVEG is strong. It resists shock. And it is remarkably easy to machine!

Standard items such as pipe, fittings, etc. can be shipped to you right from stock . . . specially designed and built tanks, and other "custom-built" equipment, will be delivered in just 4 weeks or less! So get your order in today —or write for the engineering bulletin F-5, today.

HAVEG
CORPORATION
NEWARK 47, DELAWARE

CHICAGO 11 CLEVELAND 14 HARTFORD HOUSTON 6 DETROIT 11 LOS ANGELES 13 SEATTLE 1

THE major portion of wire reeling applications can be handled by the basic methods discussed in this article, or modifications of them. To select the proper one for a particular application requires balancing the operating requirements of the job against the economics of the situation.

★ ★ ★

IN general, the correct application is the one that meets the drive requirements most economically. For example, if a certain reeling application can tolerate a variation in tension of 20 per cent, it is fundamentally wrong to apply apparatus to hold tension within five per cent if this apparatus costs more than would the equipment for holding 20 per cent.

★ ★ ★

IN application Type 1 equipments, the cost of electric equipment for a-c torque motor drives, d-c series motor drives and electronic motor control drives, will generally increase in the order named. Likewise, the number of advantages in favor of each will generally increase in the same order. The advantages of the more expensive equipments should justify their use before they are applied.

★ ★ ★

CAUTION must be exercised when applying a constant horsepower drive to make sure that the usual constant horsepower requirement for maintaining tension is not overshadowed by constant torque auxiliary loads.

★ ★ ★

Bulletin on Flat Spray Nozzles

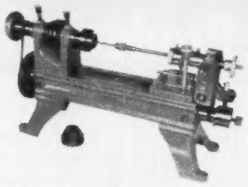
CHAIN BELT COMPANY of Milwaukee has just reprinted and revised their bulletin describing Rex Flat Spray Nozzles.

★ ★ ★

FOR a copy of this bulletin write Chain Belt Company, 1600 W. Bruce St., Milwaukee 4, Wis. and ask for Bulletin No. 48-38.

★ ★ ★

NEW ROOS
DIE ROOM EQUIPMENT
SEMI-AUTOMATIC POLISHER



MODEL OT - PATENT REGISTERED AND APPLIED FOR

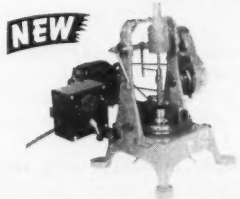
Note these outstanding features for greater accuracy in polishing dies and for prolonged machine life!
(a) Quick opening spindle
(b) Pressure adjustor
(c) New cam assembly
(d) New style leather belt

NEW STYLE TAILSTOCK
To Fit Other Model
ROOS Polisher Model OT

MODEL OT

You can quickly and easily replace the tailstock on your old Roos Semi-Automatic Polisher with the New Model OT-Tailstock. Quotation on this new Tailstock furnished on request.

ROOS
AUTOMATIC DIE SHAPING MACHINE



MODEL DS-3A

Offers you three improved features: a die rotating attachment; a time switch; and a reversing switch—which provide these advantages:
1. Die rotating attachment and time switch eliminate the formerly necessary constant attention by operator. Rotation of die is automatic, and machine shuts off automatically at end of time cycle.
2. Reversing switch permits rotation of the die in either direction.

Write today for full information!

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& MFG. COMPANY
17-19 Grove Street
Montclair, New Jersey

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JAMES L. ENTWISTLE CO.
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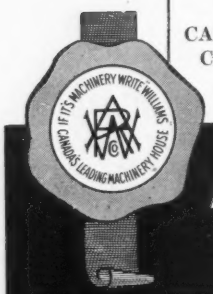
FIDELITY MACHINE COMPANY, INC.
Philadelphia, Pa.

CARBOLOY DIVISION,
CANADIAN GENERAL ELECTRIC COMPANY LIMITED
Toronto, Canada



THE A.R.WILLIAMS MACHINERY COMPANY LIMITED

HALIFAX MONTREAL OTTAWA TORONTO WINNIPEG CALGARY VANCOUVER VICTORIA

NEW — AND BETTER

PATENTING
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ANNEALING

The *Trauwood* PROCESS

OUTSTANDING ADVANTAGES

Higher and more uniform physical and fatigue properties.

No surface decarburization or scale.

Faster wire speeds . . . greater production.

Equipment fully automatic and easy to operate.

Control of heating and cooling cycles extremely accurate.

Thermal efficiency of the process very high.

Much finer grained structure possible.

High quenching temperatures rapidly attained.

Adaptable to high alloy and austenitic steel wire and strip (annealing of stainless).

The Trauwood Process, new in principle, eliminates high temperature furnaces and lead pots with their excessive maintenance costs and low thermal efficiencies. More positive temperature control is possible and quenching is done in a RISING temperature—instead of falling, as in conventional heat treating methods. The rapid rate of heating (4 to 5 times as fast as furnace heating) increases production and uniformly produces a finer grained product with higher physical and fatigue values.

Wire and rod patented by the Trauwood Process insures easier drafting and makes heavier reductions possible. In conjunction with the Trauwood patenting equipment, pickling, coating and baking can be made continuous, eliminating expensive handling and delay, materially reducing costs as compared with ordinary methods.

Complete details of the Trauwood Process will be furnished you on request. Our engineers will help you solve your continuous wire and strip patenting, tempering, and annealing problems. Write today.

THE TRAUWOOD ENGINEERING COMPANY
15200 BROOK PARK RD., Box 2719, Westpark Station, CLEVELAND, OHIO
British Representative:
JOHN RIGBY & SONS, LTD., LOW MOOR, BRADFORD—YORKS, ENGLAND

Folder Describes Electric Trucks

A FOUR-PAGE bulletin, illustrating and describing the 20 different models of electric industrial trucks and tractors made by the **Crescent Truck Company,** Lebanon, Pa., has been issued. One of the features is a questionnaire for determining the correct type and size of truck for various operations. The types include ram, palletier, platform, scoop, lift and dump trucks.

★ ★ ★

IF you would like a copy of this bulletin, please address your inquiry to **C. D. Eiler,** General Manager of the Company.

★ ★ ★

J&L Post-War Improvement Program

(*Continued from page* 342)

ONE of the world's largest batteries of coke ovens went into production at the Aliquippa Works, and by-product facilities are being rehabilitated and enlarged. This was the second battery of this size to go into operation at Aliquippa in the past three years.

★ ★ ★

NEW hot metal cars were installed and reladling pits built to replace existing hot metal mixers for open hearth and bessemer plants at Aliquippa. Extensive improvements were made in wire producing facilities.

★ ★ ★

AT Pittsburgh Works during the past year, an additional boiler was added to the North Side Power Plant, extensive changes were made in the 28 inch billet mill for improved product, one battery of coke ovens was rehabilitated, a new skull breaker was installed, and a new warehouse for cold finished steel was built.

★ ★ ★

AT Otis Works, a new open hearth furnace of the most modern design was added during the past year. At the Wire Rope Division, Muncy, Pa., expansion of warehouse and production facilities were completed. Warehouse

expansion and other improvements were completed at the Electricweld Tube Division, Oil City, Pa.

★ ★ ★

NEW facilities were completed during the past year at Benson Mines, Star Lake, New York, including a pilot plant for separation of non-magnetic iron ore from crushed ore-bearing rock.

★ ★ ★

New Carbide Catalog

THE Metal Carbides Corporation, Youngstown, Ohio, announces the publication of a new, revised Die and Wear Parts catalog No. 48-WP. This thirty-six page catalog contains full prices and particulars on Talide-tipped centerless grinder blades, sheet metal draw dies, wire and tube dies, bolt dies, drill jig bushings, gages and solid carbide bars, tubes and wear strips. Considerable engineering and design data is included.

EXTRUDERS
THAT OFFER MORE
WIRE COVERING CAPACITY

mpm

MPM offers six-zone control of electrically heated cylinders with nine-eleven or fifteen separate cooling zones for removal of frictional heat or for fast cooling. Higher temperatures—higher screw speeds—higher production—per machine.

FLEXIBILITY - Operating Economy

These MODERN machines are furnished electrically heated but can be heated or cooled by steam, oil, water, etc. Interchangeable heads and dies to produce covered wire, tubing, rods, strips, wide sheeting are also available along with conveyors, granulators, dryers, etc.

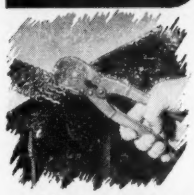
FAST DIE OR SCREEN CHANGES

Modern engineering and specialization has resulted in the installation of these machines with 18 of a possible 20 leading material suppliers during the past two years. More complete cooperation with foreign customers too has made MPM the largest exporters of Extruding equipment during the same period.

modern plastic machinery corp. mpm
GREATER Flexibility = MORE PROFITS!
SEND FOR BROCHURE
15 UNION ST., LODI, N. J.
CABLE ADDRESS MODPLASEX

CUT WIRE CABLE

WIRE CUTTING



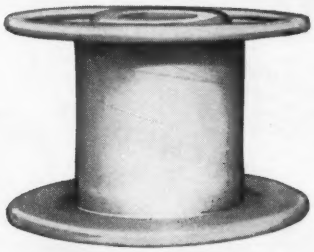
For simple wire cutting jobs, use one of the 3 New Porter *one-hand* HandKliP Cutters. They do the job in *less time* with *less effort*. Types to cut steel strapping .035" x 1¼", wire, wire rope and rods up to 5/16", ¼" annealed bolts in the thread and similar metals. Lightweight, compact, easy to carry. Adjustable for longer service.
Ask for HandKliP folder.

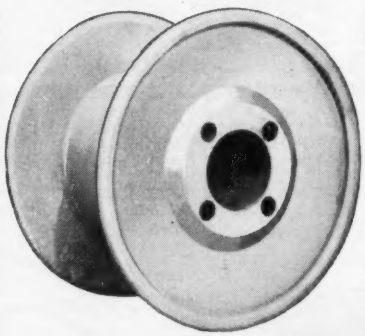
CABLE CUTTING

Cutting Lead Sheathed Paper Insulated Communication Cable is *easier* when you use the Porter LSC Cutter. Rugged, keen-edged blades cut the toughest cables *cleanly, swiftly*. Will not damage the cable or wires. Cuts up to 2¼" communication cable; 750,000 circular mils insulated stranded copper wire. Ask for LSC circular.

H. K. PORTER, INC.
Somerville 43, Mass.

FOR HIGHEST SPEEDS





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PRECISION
STEEL REELS

The reels that are engineered to the job... designed and built by the company that originated the steel reel idea . . . are the reels you should be using in your plant. Every year, more and more Apco Mossberg Steel Reels are bought by quality-minded buyers throughout the wire industry.

FREE
ENGINEERING SERVICE
Without obligation to you, Apco Mossberg engineers will be glad to study your reel problem, and supply complete suggestions, drawings, blue prints. Write for information today. *Canadian Representatives:* Hugh Williams & Company, 47 Colborne St., Toronto, Ontario. *Pacific Coast Rep.,* Jack P. Williams, Jr., Matson Building, 215 Market St., San Francisco 5, Calif.

REELS . . . SPOOLS . . . BOBBINS

APCO MOSSBERG COMPANY
(THE ORIGINAL FRANK MOSSBERG CO.)
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SPECIALIZED WIRE
for WIRE FABRICATORS

Whatever your wire fabrication problem, there is a Cortland Brand specialized low carbon wire to help you make a better product with fewer production stops and rejects. Made with best corrosion-resisting steel from Wickwire's own mills —

All Finishes: Plain, galvanized, coppered or tinned.
All Sizes: Coils, spools, or straightened cut to length.
All Types: Stone wire, bookbinder, flat wire, etc.

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WICKWIRE BROTHERS, INC. CORTLAND, N. Y.

WIRE FOR WEAR

CONTINENTAL STEEL CORP. STEEL CONTINENTAL WIRE KOKOMO, IND.

● IMPROVED THROUGH RESEARCH
● PROVED IN HARDEST USE

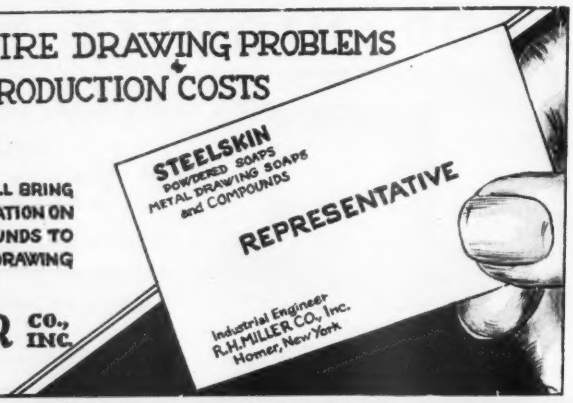
Constant improvement through research and constant proof in toughest use have established Continental as the "wire for wear." Whether the need is for wire to stand up under difficult forming operations . . . or for a special shaped wire to provide smarter-looking, longer-lasting trim . . . Continental is the wire that wins friends and holds customers. Write us at Kokomo.

CONTINENTAL STEEL
CONTINENTAL STEEL CORPORATION

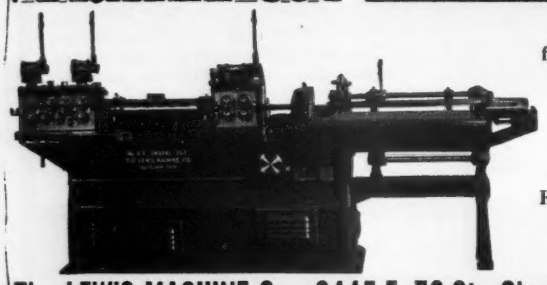
Solve
Reduce
WIRE DRAWING PROBLEMS
PRODUCTION COSTS

YOUR INQUIRY WILL BRING YOU FULL INFORMATION ON SOAPS AND COMPOUNDS TO SOLVE YOUR WIRE DRAWING PROBLEMS

R.H.MILLER CO., INC.
HOMER, NEW YORK
ESTABLISHED 1909



LEWIS TRAVELCUT WIRE STRAIGHTENING and CUTTING Machines



Machines for 1/16" to 3/4" rod
Round
Square
Flat
Hexagon
Ferrous and Non-Ferrous

Automatic
High Speed
Heavy Duty

LEWIS

The LEWIS MACHINE Co., 3445 E. 76 St., Cleveland, O.

Syncro Buys Rights to "Cook Annealer"

THE Syncro Machine Co., 611 Sayre Ave., Perth Amboy, N. J., has announced to the wire industry the acquisition by them of all the sales and manufacturing rights to the "Cook Continuous Electric Strand Annealer" developed by the Cook Engineering Company of Paterson, N. J. The process comprises the application of resistance heating to non-ferrous wire during its passage from the wire drawing machine to the reeler or takeup.

★ ★ ★

THIS ingenious equipment, which is installed directly in line with the wire drawing machine, provides for the production of bright annealed wire at the maximum speed of the drawing operation and eliminates the hazards of tarnished, sticky, non-uniformly annealed wire frequently obtained when the wire is annealed on reels in the enclosed types of furnaces in general use.

★ ★ ★

THE annealer is made in several sizes to provide for the continuous drawing and annealing of wire from rod breakdown machines to fine wire machines.

★ ★ ★

COOK annealing devices have been in operation for several years in a number of plants producing copper wire and have been thoroughly proven. The equipment eliminates excessive time, extra handling and the large amount of floor space required by conventional methods.

★ ★ ★

SYNCRO has installed in its plant a complete fine wire drawing machine and continuous annealer and will be pleased to demonstrate the process to interested parties by appointment.

★ ★ ★

Grants to Universities to "Stock-Pile" Knowledge

THE DU PONT COMPANY has announced that it is instituting a program of grants-in-aid to ten universities for the 1949-50 aca-

H-12 WIRE ENAMELING MACHINE NO. 885

Electric Heated Oven (Single Sided) Take-up is Horizontal With Dual Spindles For Large or Small Reels.

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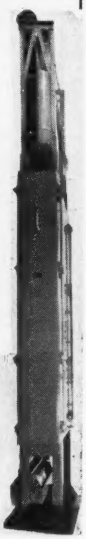

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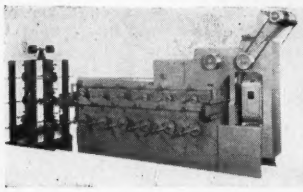

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demic year for unrestricted use in the field of fundamental chemical research. The program, which at the start will be on a trial basis, has the aim of raising the amount of such research being done in this country above present levels, with a view to "stock-piling basic knowledge."

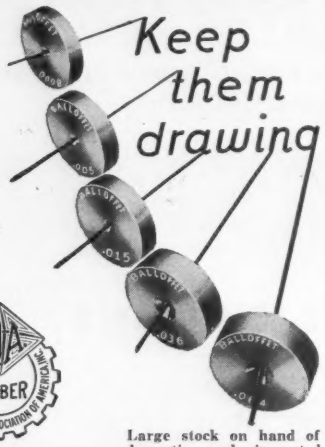
* * *

IN announcing the new program, **Crawford H. Greenewalt,** president of the DuPont Company, said that these grants-in-aid are designed to help insure the flow of fundamental knowledge in science upon which the future industrial development of our country and the standard of living of the American people are so dependent.

* * *

THE ten universities to which grant-in-aid of $10,000 each are being offered are California Institute of Technology, Cornell University, Harvard University, Massachusetts Institute of Technology, Ohio State University, Princeton University, Yale University, University of Illinois, University of

Balloffet
DIAMOND DIES



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* * *

THE grants are being awarded for the academic year of 1949-50, but it is the company's hope, should the program work out satisfactorily, to continue each of them for a period of five years. The Universities themselves will select the research projects in which the grants will be employed, the only stipulation being that they be free from any commercial implications at the time the work is initiated.

* * *

New Self-Bonding Insulating Tape Announced

THE **Bishop Gutta-Percha Company,** 420 East 25th Street, New York, 10, N. Y., announces the development of BI-SEAL, a new, self-bonding electrical insulating tape which, when applied under normal wrapping tension such as in splicing electrical connections, coheres to itself and adheres to other insulations to pro-

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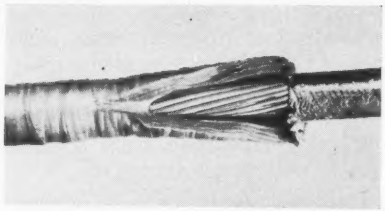
duce a permanent insulating barrier.

★ ★ ★

THE illustration below shows a spliced electrical connection which has been wrapped with BI-SEAL, and then cut open to indicate the manner in which layer upon layer forms a practically solid insulation.

★ ★ ★



BI-SEAL, a blend of synthetic polymers, is compatible with natural, synthetic, and butyl rubber, polyethlene, and vinyl insulations. It has outstanding dielectric strength in excess of 1,000 volts per mil of thickness, as well as excellent ageing characteristics and shelf life, with no sign of deterioration after 72 hours of ozone exposure. This tape is acid, moisture, and alkali resistant.

★ ★ ★

BI-SEAL is available in 30-yard rolls, in a standard thickness of .020", and in any desired width.

★ ★ ★

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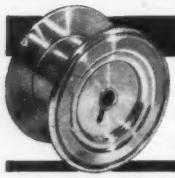

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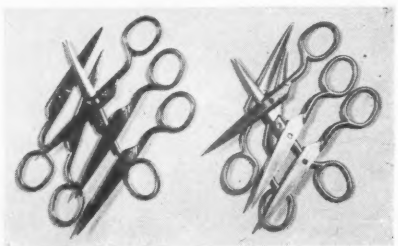
Enthone Announces A New Chemical Stripper for Nickel and Other Metal Coatings

ENTHONE, INC., 442 Elm Street, Dept. WWP, New Haven, Conn. have announced the development of a material called "Enthone Metal Stripper" for chemically dissolving nickel and other metal coatings from steel without attacking the steel. The stripper is alkaline in nature, can be contained in a steel tank and requires no electric current. The parts to be stripped are merely immersed in a solution of Enthone Metal Stripper salts, in the temperature range from 160-180°F. Stripping speed varies from .0002" to over .001" per hour depending upon the concentration of salts and the operating temperature.

STRIPPER



LEFT: Nickel plated parts before stripping.
RIGHT: Parts after stripping showing no attack on the base steel.

★ ★ ★

THE process is stated to be ideal for removing of nickel plate from bulk work, such as barrel nickel plated steel, which hitherto-fore has been impossible or difficult to strip without attacking the base metal. The Enthone process does not etch or attack the base steel in any way. The steel is left in the same condition as it was prior to plating and, in most cases, the work needs merely be dipped in acid and can be replated.

★ ★ ★

THE stripper is also effective for removing copper plate from steel as well as silver, cadmium and zinc. The solution is not suitable for removing nickel coatings from zinc base die castings or copper alloys.

★ ★ ★

ENTHONE Metal Stripper comes under U. S. Patent No. 2460896 and further patents are pending.

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WIRE WORKING MACHINERY
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SLEEPER & HARTLEY Nos. 1, 2, 3, 3½, 4 and 5 Universal Coilers.
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LEWIS & SHUSTER Round and Shaped Wire Automatic Straightening and Cutting Machines.
NATIONAL MACHINERY EXCHANGE
128-138 MOTT ST. NEW YORK, N. Y.

A Recent Review of Wire Patents

(*Continued from page 253*)

There are 11 claims to this transformer coil winder having specific control means which reduces the number of moving parts.

★ ★ ★

NO. 2,462,396, WIRE STRAIGHTENER, patented February 22, 1949 by Richard D. Heller, Tujunga, Calif.

This straightener is of the general type of the inventor's prior apparatus (Patent 2,228,390) and the wire bending elements may be varied in spacing so that the abruptness of bending may be varied to suit various requirements.

★ ★ ★

NO. 2,462,474, COATING APPARATUS FOR WIRES, FILAMENTS AND THE LIKE, patented February 22, 1949 by James K. Delano, Rye, N. Y.

It is stated that a uniform coating for wire may be had and applied while the wire is traveling at a relatively high speed.

★ ★ ★

NO. 2,462,515, METHOD OF AND APPARATUS FOR BRAIDING, patented February 22, 1949 by Brooke W. Lerch, Baltimore, Md., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

More specifically, the apparatus and method are applicable to braiding covering on wire, the coverings comprising non-metallic strands rotated in one direction about the wire, and metallic strands rotated in the opposite direction and all interbraided. The wire and covering are twisted in such a direction as to wind the metallic strands more tightly around the core so that the metallic strands tend to cling to the core.

★ ★ ★

NO. 2,462,539, WIRE SPRING STRUCTURE FOR SEAT AND BACK CONSTRUCTIONS, patented February 22, 1949 by William H. Neely, Cleveland, and Svend G. Blumensaadt, Beachwood Village, Ohio, assignors to The Universal Wire Spring Company, Cleveland, Ohio, a corporation of Ohio.

This construction includes a number of sinuously corrugated wire springs having parallel top and bottom portions and inclined spacing and supporting portions connected with the top and bottom portions, these springs being assembled in rows, and some of the springs of the rows having their parallel portions overlapping each other a full loop of their corrugations and the overlapping portions secured to each other at spaced points to provide a spring structure with stiffened parallel portions yieldingly spaced from each other by the spacing and supporting members of the springs.

★ ★ ★

NO. 2,462,763, PROTECTIVELY COATED FERROUS METAL SURFACES AND METHOD OF PRODUC-

THE MONTGOMERY COMPANY
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25 CANAL STREET
WINDSOR LOCKS, CONN.

BARE ELECTRIC TINSEL CONDUCTOR and RESISTANCE TINSEL CORDAGE • TINSEL LAME • DECORATIVE TINSEL THREADS, CORDS, LAMINETTES

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970 lbs.	.200 x .130	D.G.
680 lbs.	.220 x .075	Acetate
1930 lbs.	.250 x .135	D.G.V.
690 lbs.	No. 27	D.C.C.
595 lbs.	No. 34	S.S.E.
970 lbs.	No. 35	D.C.C.

Novel Products Co.
42-61 24 St., L. I. C., N. Y.
St 6-6200 Mr. Gaess

ING SAME, patented February 22, 1949 by Victor Charles John Nightingall, deceased, late of Heidelberg, Victoria, Australia, by Ruth Valencia Nightingall, Aubrey Mitchell Old, Charles Montefiore Gladstone Nightingall, James B. Aitken, and Maxwell G. McKenzie executors, Melbourne, Victoria, Australia, assignors to Di-Met Proprietary Limited, West Melbourne, Victoria, Australia, a corporation of Victoria, Australia.

A hard coating is provided by applying a composition comprising finely divided metallic zinc incorporated in an aqueous solution of an alkali silicate, the aqueous solution containing about 20% to 40% by weight of the alkali silicate, the zinc being present in amount of about 100% to 350% by weight of this solution, and converting the coating to a substantially insoluble condition by reacting carbon dioxide therewith.

★ ★ ★

NO. 2,462,770, ELECTRIC CABLE, patented February 22, 1949 by Walter T. Peirce, Worcester, Mass., assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

It is stated that, in this oil-sheath cable, which includes three stranded wire conductors, the pressure of the oil will always be above atmospheric.

★ ★ ★

Keystone Wire Cloth Develops New Frameless Tension Screen

A NEW all aluminum "frameless tension" screen is being announced by the **Keystone Wire Cloth Company** of Hanover, Pennsylvania. Designed for double hung windows this new screen can be quickly installed by home owner without tedious fitting. Width and height measurements given to the dealer, insures screens of proper size. Screens are snapped on upper blind stop and drawn taut at will with simple thumb screw. Tension is maintained on sides by a five strand selvage edge and a special free-floating sill bar at bottom corrects out-of-square sills.

★ ★ ★

SALES points, according to the manufacturer, are ease of installation, no rust or staining, no painting or upkeep, easy storage, neat appearance and low original cost less than fitted wood frame and screening, without paint or hardware.

★ ★ ★

DEALERS are able to offer a complete screen in one package which can be hung in a few minutes by the purchaser.

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One (1) complete Wind Up Unit, consisting of tensioning device—3 wind ups and electrical controls. These Wind Ups handle Iron Reels 18" dia. Head x 10" Traverse. Each Unit consists of the tensioning device which handles three wires at a time and the electrical control and three separate wind ups, each driven by a constant torque variable speed motor capable of exerting a constant tension pull on the material being wound up. These units are in excellent condition. These units are capable of winding lead, solder wire, and copper wire. Reply Box 522, WIRE & WIRE PRODUCTS.

WANTED used 4-hole low carbon wire drawing equipment from .265 rods to approximately .090". AC Current only.
Box 523, WIRE & WIRE PRODUCTS

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65,000 lbs. of galvanized, Spec. A-1; 140,000 lbs. Hi-Ten., 13 ga. wire. Coils weight 50 to 55 lbs. each and are wrapped in waterproof paper. All in A-1 condition. Bought for basket handles and cannot be used. Please write to Box #525, % WIRE & WIRE PRODUCTS.

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AN out-of-doors testing station in Miami, Florida provides the maximum of exposure to the sun's rays for weather testing of materials and products. Arrangements have been made by **Sam Tour & Co., Inc.,** 44 Trinity Place, New York for such testing service.

★ ★ ★

THIS firm of metallurgists, engineers and consultants makes use of these Southern Florida facilities because cloud interference is at the minimum. This permits the maximum of actual exposure to rain, wind and salt water as well as to intense sunshine and makes it possible to conduct weather exposure tests on a year round basis.

★ ★ ★

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ABRASIVES—
Norton Co., Worcester, Mass.

ACID INHIBITORS—
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

ACID-PROOF CONSTRUCTION
Haveg Corporation, Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.
Sauereisen Cements Co., Pittsburgh, Pa.

ANNEALING MACHINES—Open Flame
Syncro Machine Co., Perth Amboy, N. J.

ANNEALING POTS AND BOXES—
National Annealing Box Co., Washington, Penna.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.

ARMORING EQUIPMENT—
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machy., Inc., Pawtucket, R. I.

BAKERS—Rod and Wire
Carl-Mayer Corp., The, Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Ross, J. O., Engr. Corp., New York, N. Y.

BAR STOCK—Stainless Steel
Armco Steel Corp., The, Middletown, Ohio.
American Steel & Wire Company, Cleveland Chicago, New York.
Columbia Steel Co., San Francisco, Calif.
U. S. Steel Export Company, New York, N. Y.

BENDERS—
O'Neil Irwin Mfg. Co., Minneapolis, Minn.

BOBBINS—Braider & Wire Weaving
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

BORAX—Wire Drawing
Pacific Coast Borax Corp., New York, N. Y.

BORON CARBIDE—
Norton Co., Worcester, Mass.

BRAKES—Pneumatic
Entwistle, Jas. L. Co., Pawtucket, R. I.

BRAKES & SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

CABLE LACQUERING OVENS—
Industrial Ovens, Inc., Cleveland, O.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

CASTINGS—Wire Mill
Scudder, E. J., Fdry. & Mach. Co., Trenton, N.J.

CEMENTS—Acid Proof
Sauereisen Cements Co., Pittsburgh, Pa.

CEMENTS—Refractory
Norton Co., Worcester, Mass.
Sauereisen Cements Co., Pittsburgh, Pa.

CHEMICALS—Cleaning
(See Cleaners—Metal)

CLEANERS—Metal
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.
Metal & Thermit Corp., New York, N. Y.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

CLEANING & PICKLING EQUIP.—
Cleveland Tramrail Div., of the Cleveland Crane & Engineering Co., Wickliffe, O.
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.
Metal & Thermit Corp., New York, N. Y.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

CLOTH TESTERS—
Scott Testers, Inc., Providence, R. I.

CLOTH—WIRE, All Metals
Roebling's, John A. Sons, Co., Trenton, N. J.
Wickwire Spencer Steel Division, Colorado Fuel & Iron Corp., Buffalo, N. Y.

COATING COMPOUNDS—
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

COILERS—Sheet, Strip and Wire
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J. Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

COLD HEADERS—
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Diamond
Engis Equipment Co., Chicago, Ill.
Magnus Chemical Co., Garwood, N. J.

COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Metal & Thermit Corp., New York, N. Y.

COMPOUNDS—Rust Preventing
American Chemical Paint Co., Ambler, Pa.
American Lanolin Corp., Lawrence, Mass.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corporation, Brooklyn, N. Y.
Miller, R. H. Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Pacific Coast Borax Corp., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Inc., Chicago, Ill.
Swift & Company, Chicago, Ill.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

CORROSION PREVENTIVES
Angier Corp., The, Framingham, Mass.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Metal Carbides Corporation, Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, New York.
Vascoloy-Ramet Corp., North Chicago, Ill.
Willey's Carbide Tool Co., Detroit, Mich.

CUTTING TOOLS—Wire
Porter, H. K., Inc., Everett, Mass.

DIAMONDS—Industrial
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Champion Diamond Co., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDERS—
Champion Diamond Co., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND TOOLS—
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Carbide
(See Dies—Tungsten Carbide)

DIES—Cold Heading
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio.
Vascoloy-Ramet Corp., No. Chicago, Ill.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Cochaud Wire Die Corp., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Extrusion
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
L & H Die Co., Royal Oak, Mich.
Metal Carbides Corporation, Youngstown, Ohio.
Robertson, John, Co., Brooklyn, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Eyelet
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
L & H Die Co., Royal Oak, Mich.
Metal Carbides Corp., Youngstown, O.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Special Shapes, Etc.
Eastern Carbide Corp., New Rochelle, N. Y.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

WHERE TO BUY, Continued

DIES—Tantalum Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Williams, A. R. Machy. Co., Ltd., Toronto, Canada.

DIES—Tube Drawing
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
L & H Die Co., Royal Oak, Mich.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.
Williams, A. R. Machy. Co., Ltd., Toronto, Canada.

DIES—Tungsten Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
L & H Die Co., Royal Oak, Mich.
Metal Carbides Corp., Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRUMS—Flange Steel
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., The, Paterson, N. J.

DRYING EQUIPMENT—
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Modern Plastic Machinery Corp., Lodi, N. J.
Rockwell, W. S. Co., Fairfield, Conn.
Ross, J. O., Engineering Corp., New York, N. Y.

ENGINEERS—Consulting Hot Galvanizing
Wallace G. Imhoff Co., The, Los Angeles, Calif.

ENGINEERS—Consulting Spring Design
Carlson, Co., The, New York, N.Y.

ENGINEERS—Consulting Wire Mill
Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Insulation Testing
Davis, R. L., Elec. Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.
Williams, A. R. Machy. Co., Ltd., Toronto, Canada.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M. Co., Pittsburgh, Pa.

FRICTION PAY-OFF STANDS—
Industrial Ovens, Inc., Cleveland, Ohio.

FURNACES—Annealing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Rockwell, W. S., Co., Fairfield, Conn.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Electric
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Hard'ing & Temp'ing
Ajax Electric Co. Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., The, Cleveland, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio.
Robertson, John, Co., Brooklyn, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Oxidizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Normalizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Pot (Oil, Gas, Electric)
Ajax Electric Co., Inc., Philadelphia, Pa.

FURNACES—Resistance Heating, Strand
Trauwood Engineering Co., Cleveland, Ohio.

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corporation, Toledo, O.
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corporation, Toledo, O.
Trauwood Engineering Co., The, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

GALVANIZING EQUIPMENT—
Steel Equipment Co., Cleveland, Ohio.
Wean Equipment Corp., Cleveland, Ohio.

GALVANIZING KETTLES—
National Annealing Box Co., Washington, Penna.

GRINDERS—Roll
Norton Co., The, Worcester, Mass.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio.

HOOKS—Pickling and Liming
Gordon, Clark E., Detroit, Mich.
Youngstown Welding & Engineering Co., Youngstown, Ohio.

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

INSULATING LACQUERING SYSTEMS—Continuous
American Insulating Machine Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.

INSULATING MATERIALS—
Du Pont de Nemours, E. I., Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Martin, Glenn L., Company, Baltimore, Md.
Owens Corning Fiberglas Corp., Toledo, O.
Twitchell, E. W., Philadelphia, Pa.

LATHES—Die Reaming
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Morgan Construction Co., Worcester, Mass.
Roos, Tool & Mfg. Co., Montclair, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co. Waterbury, Conn.

LIME—
Warner Co., Philadelphia and Bellefonte, Pa.

LININGS—Acid and Alkali Proof
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.
Sauereisen Cements Co., Pittsburgh, Pa.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUMBER—Wire Mill, for lagging and car blocking.
North Anson Reel Co., North Anson, Maine

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Brazing
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Bunching
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Nilson, A. H. Machine Co., The, Bridgeport, Conn.

MACHINERY—Cable, Rope Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Boyd, Charles P., Corp., Philadelphia, Pa.
Rockwell, W. S., Co., Fairfield, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

WHERE TO BUY, Continued

MACHINERY—Coilers
Boyd, Charles P., Corp., Philadelphia, Pa.
Eisler Engineering Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (used), New York, N. Y.
New England Butt Co., Providence, R. I.
Ruesch, H. J. Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Williams, A. R. Machy. Co., Ltd., Toronto, Canada.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

MACHINERY—Copper Wire Drawing and Rolling
American Insulating Mach'y Co., Phila., Pa.
National Machinery Exchange (used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio.
Mettler Machine Tool, Inc., New Haven, Conn.
National Mach'y Exch. (Used) New York, N. Y.
Nilson Machine Co., A. H., Bridgeport, Conn.
Porter, H. K., Inc., Everett, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Die Making
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Roos, Tool & Mfg. Co., Montclair, N. J.
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Draw Benches
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Edging
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Extruding
Modern Plastic Machinery Co., Lodi, N. J.
Robertson, John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Fence
Blashill, Arthur, Woodstock, Ont., Canada.
Glader, Wm., Machine Works, Chicago, Ill.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Galvanizing
(See Galvanizing Equipment)

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Pawtucket, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
Modern Plastic Machinery Co., Lodi, N. J.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lead Encasing Presses, etc.
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Material Handling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MACHINERY—Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, Jas. L. Co., Pawtucket, R.I.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Black Industries, Cleveland, Ohio.
Eastern Nail Co., Providence, R. I.
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I

MACHINERY—Pickling
Gordon, Clark E., Detroit, Mich.
Youngstown Welding & Engineering Company, Youngstown, Ohio.

MACHINERY—Pointing
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rubber Insulating
Royle, John & Sons, Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Screw Wire
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila, Pa.
Black Industries, Cleveland, Ohio.
Eastern Nail Co., Providence, R. I.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Ruesch, H. J. Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Boyd, Charles P. Corp., Philadelphia, Pa.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Modern Plastic Machinery Co., Lodi, N. J.
National Mach'y Exch. (Used), New York, N.Y.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Spring Making
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Williams, A. R. Machy. Co., Ltd., Toronto, Canada.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Lewis Machine Co., The, Cleveland, Ohio.
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N.Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Stranding
Hughesville Machine & Tool Co., Hughesville, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Ruesch, H. J., Machine Co., Newark, N. J.
Steel Equipment Co., Cleveland, Ohio.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Swaging
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Foundry & Machine Co. Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Testing Physical
Eberbach & Son Co., Ann Arbor, Mich.
Scott Testers, Inc., Providence, R. I.

MACHINERY—Testing Equipment—Sparkers
Davis, R. L. Elec. Co., Wallingford, Conn.
Dillon, W. C. & Co., Inc., Chicago, Ill.
Entwistle, Jas. L., Pawtucket, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Welding Wire
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

WHERE TO BUY, Continued

MACHINERY—Wind-up (Constant Tension, Variable Speed)
Industrial Ovens, Inc., Cleveland, Ohio.
Modern Plastic Machinery Co., Lodi, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co. Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Wire Forming
Eisler Engineering Co., Newark, N. J.
National Mach'y Exch. (Used), New York, N.Y.
Nilson Machine Co., A. H., Bridgeport, Conn.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wood Screw
National Mach'y Exch. (Used), New York, N.Y.

MACHINERY—Wrapping Wire Coils
Angier Corporation, Framingham, Mass.

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MATERIAL—Resistance Heating Strand
Trauwood Engineering Co., Cleveland, Ohio.

MILLS—Tandem, Rolling & Edging
Torrington Mfg. Co., Torrington, Conn.

NAILS—Wire
American Steel & Wire Co., Cleveland, Chicago, New York
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling, John A. Sons Co., Trenton, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.
U. S. Steel Export Co., New York, N. Y.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Chase Brass & Copper, Waterbury, Conn.
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.

OVENS—Dehydrogenizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.

OVENS—Industrial
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Ross, J. O., Engr. Corp., New York, N. Y.

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Ross, J. O., Engr. Corp., New York, N. Y.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Pa.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Angier Corp., The, Framingham, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.

PAPER—For Coil Wrapping and Corrosion Prevention
Angier Corporation, The, Framingham, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.

PAPER TESTERS—
Scott Testers, Inc., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D.C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

PICKLING—Hooks, etc. Acid Resisting
Gordon, Clark E., Detroit, Mich.

PICKLING TANK LININGS—
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.
Sauereisen Cements Co., Pittsburgh, Pa.

PIPES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio

PLASTIC TESTERS—
Scott Testers, Inc., Providence, R. I.

PNEUMATIC CYLINDERS
Entwistle, James L. Co., Pawtucket, R. I.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio

POTS—Lead Melting
National Annealing Box Co., Washington, Pa.
Robertson, John, Co., Brooklyn, N. Y.

POWDER—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Pa.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

REEL AND TENSION STANDS—
Davis, R. L. Electric Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Drawn Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS & SPOOLS—Collapsible
Entwistle, Jas. L. Co., Pawtucket, R. I.

REELS & SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS AND SPOOLS—Shipping and Shop
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg., Co., The, Hazardville, Conn.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.
North Anson Reel Co., North Anson, Maine

REELS—Metal Bound
Durkee Mfg. Co., Pine River, Minn.
Hubbard Spool Co., Chicago, Ill.
North Anson Reel Co., North Anson, Maine

REELS—Takeoff
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg., Co., The, Hazardville, Conn.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.
North Anson Reel Co., North Anson, Maine

REELS—Vulcanizing & Impregnating
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wire Drawing
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg., Co., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.
North Anson Reel Co., North Anson, Maine

REELS & SPOOLS—Wooden
Acrometal Products, Inc., Minneapolis, Minn.
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
North Anson Reel Co., North Anson, Maine

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

RESISTANCE HEATING—Annealing, Patenting, Etc.
Trauwood Engr. Co., Cleveland, Ohio.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Ross, J. O., Engineering Corp., New York, N.Y.

RODS—Nickel Alloy
Eastwood Nealley Corp., Belleville, N. J.
International Nickel Co., Inc., New York, N.Y.

RODS—Stainless Steel
Armco Steel Corp., The, Middletown, Ohio.

RODS—Wire—Non-Ferrous
Eastwood Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

WHERE TO BUY, Continued

ROPE—Wire
American Steel & Wire Company, Cleveland, Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Roebling's John A., Sons Co., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire-Spencer Steel, Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott Testers, Inc., Providence, R. I.

RUST PROOF COMPOUNDS—
(See Compounds—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See Compounds—Rust Preventing)

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y Inc., Pawtucket, R. I.

SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

SHEET—Steel
Armco Steel Corp., The, Middletown, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

SOAPS—Industrial and Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Inc., Chicago, Ill.
Swift & Company, Chicago, Ill.

SOLVENT RESIN SYSTEMS—Experimental
Industrial Ovens, Inc., Cleveland, Ohio.

STAMPINGS—Steel
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non-Ferrous
Chase Brass & Copper, Waterbury, Conn.
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Armco Steel Corp., The, Middletown, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., Paterson, N. J.

TANKS—Compound
Atlas Mineral Products Co. of Pa., Mertztown, Pa.
Haveg Corp., Newark, Del.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Haveg Corp., Newark, Del.
Rockwell, W. S., Co., Fairfield, Conn.
Sauereisen Cements Co., Pittsburgh, Pa.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.
Rockwell, W. S., Co., Fairfield, Conn.
National Annealing Box Co., Washington, Pa.

TINSEL—Cords, Decorative
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TINSEL—Electric Conductor
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TINSEL—Electric Resistance
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TINSEL—Lame, Silver and False Gold
Hudson Wire Co., Ossining, N. Y
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TINSEL—Thread, Silver and False Gold
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TINSEL—Thread, Decorative
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TOOLS—Wire Cutting
Porter, H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRAVERSES—For Reels
Entwistle, James L. Co., Pawtucket, R. I.
Hubbard Spool Company, Chicago, Ill.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

TUBE BENDERS AND FORMERS—
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Ruesch, H. J., Machine Co., Newark, N. J.

VALVES AND FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VARNISHES—For Insulation
General Electric Co., Schenectady, N. Y.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago Ill.

WIND-UP AND UNWIND SYSTEMS—Continuous
American Insulating Mach'y Co., Phila., Pa.
Davis R. L. Electric Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

WIRE—Aluminum
Aluminum Co. of America, Pittsburgh, Pa.
Malin & Co., Cleveland, Ohio.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
Armco Steel Corp., The, Middletown, Ohio.
American Steel & Wire Co., Cleveland-Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Electric
Chase Brass & Copper, Waterbury, Conn.
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Enameled for Coils
North American Philips Co., Inc., New York, New York
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Armco Steel Corp., The, Middletown, Ohio.
American Steel & Wire Co., Cleveland-Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper, Waterbury, Conn.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div. of Colorado Fuel & Iron Corp., Buffalo, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
American Steel & Wire Co., Cleveland-Chicago, New York
Columbia Steel Co., San Francisco, Calif.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., Cleveland, Ohio.
U. S. Steel Export Co., New York, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.

WIRE—Nickel & Nickel Alloy
Eastwood-Nealley Corp., Belleville, N. J.
International Nickel Co., Inc., New York, N.Y.

WIRE—Nickel Silver and Phosphor Bronze
Chase Brass & Copper, Waterbury, Conn.
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Non-Ferrous to Specification for Special Purposes
Chase Brass & Copper, Waterbury, Conn.
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.
North American Philips Co., Inc., New York, New York.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
American Steel & Wire Co., Cleveland-Chicago, New York.
Armco Steel Corp., The, Middletown, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Indiana.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
U.S. Steel Export Co., New York, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
Armco Steel Corp., The, Middletown, Ohio.
American Steel & Wire Co., Cleveland-Chicago, New York
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Straightening and Cutting—
Pittsburgh Cut Wire Co., Pittsburgh, Pa.
Wickwire Brothers, Inc., Cortland, N. Y.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE CLOTH—Industrial
Roebling's John A., Sons Co., Trenton, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.

WIRE TESTERS—
Scott Testers, Inc., Providence, R. I.

WIRE, WEAVING—Non-Ferrous
Chase Brass & Copper, Waterbury, Conn.
Hudson Wire Co., Ossining, N. Y.

WRAPPING PAPER—Creped
Angier Corporation, Framingham, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.

YARNS & TAPES—
Du Pont de Nemours, E. I., Co., Wilmington, Delaware
General Electric Co., Schenectady, N. Y.
Owens Corning Fiberglas Corp., Toledo, Ohio.
Twitchell, E. W., Philadelphia, Pa.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

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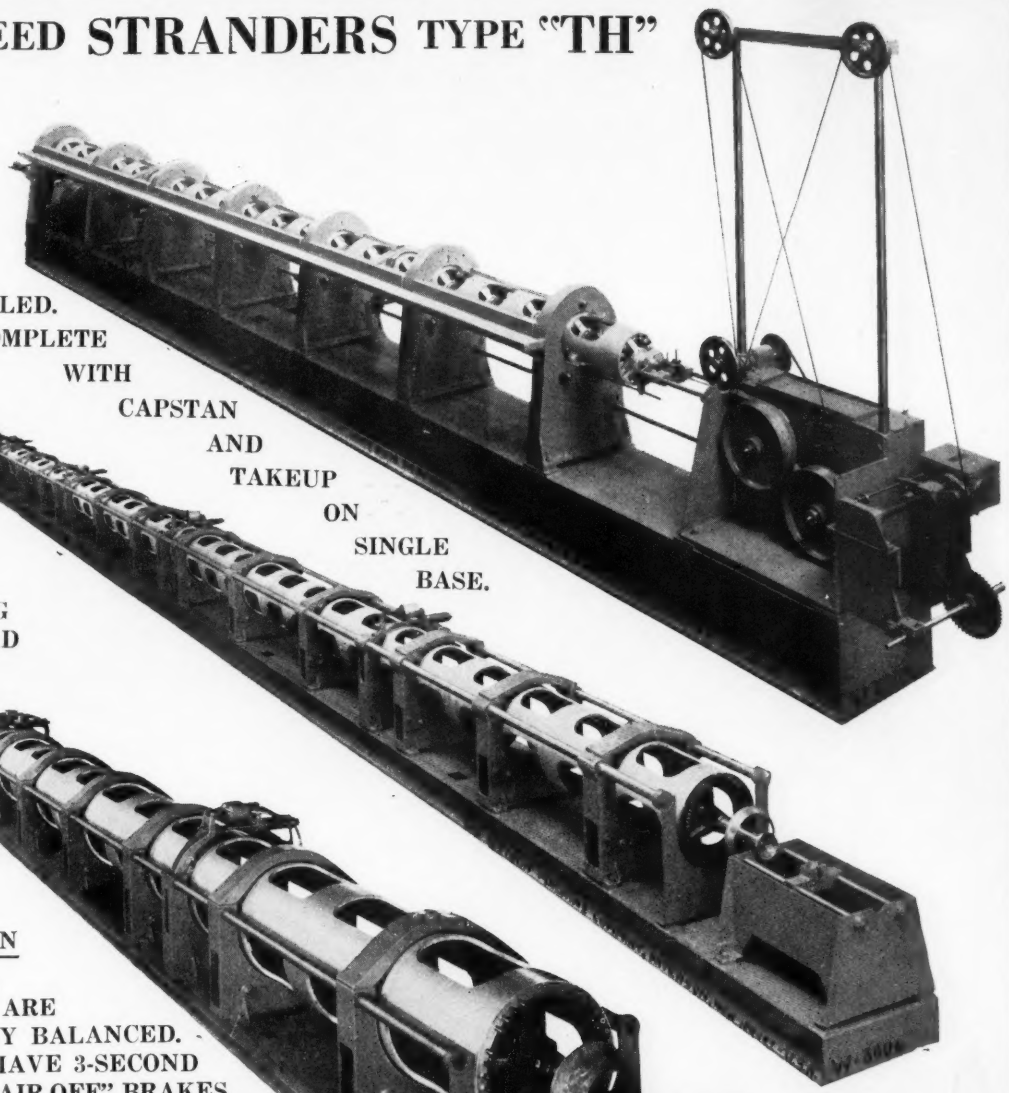

19-SPOOL
TH2 - 3
No. W-2577
STRANDING
MACHINE.
CLOSE COUPLED.
COMPLETE
WITH
CAPSTAN
AND
TAKEUP
ON
SINGLE
BASE.

46-SPOOL
TH6 - 8
No. W-3006
STRANDING
HEAD

25-Spool
TH9 - 4
No. W-2773
STRANDING
HEAD

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MANY SIZES.

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Literature on request

SCALE-FREE ANNEALING NICKEL-SILVER AND ALLOY WIRE

● The installation view above shows another interesting EF gas-fired recuperative radiant tube special atmosphere continuous roller hearth furnace. This equipment clean and scale-free anneals nickel-silver and other alloy wire in coils—handles 700 lbs. of wire per hour, in coils up to 30" in diameter, weighing from 65 to 85 lbs. each.

The EF combustion type generator for producing the special protective atmosphere and the desulphurizing unit for removal of hydrogen sulphide from the combustion atmosphere before introducing it into the furnace, are shown at the left.

EF furnaces are built in many different types, for performing a wide variety of heat treating processes. Sizes to meet any production requirement—gas-fired, oil-fired, or electrically heated, whichever is best for your particular problem,—and location. No installation is too large or too unusual for EF engineers. Let us work with you on your next furnace problem.

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OIL-FIRED
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